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MINUTES OF THE PROCEEDINGS

OF THE

METEOROLOGICAL COUNCIL,

1877—1878.

LONDON:
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1878.

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MINUTES OF THE PROCEEDINGS

OF THE

METEOROLOGICAL COUNCIL.

1877.

116, *Victoria Street, July* 9, 1877.

PRESENT:

PROFESSOR H. J. S. SMITH (CHAIRMAN).

MR. DE LA RUE.	THE HYDROGRAPHER.
MR. GALTON.	PROFESSOR STOKES.

Mr. Scott was in attendance.

Read—Letter No. 1664, from the Royal Society appointing the Council, as follows:

M.O. 1664. The Royal Society, Burlington House,
9th July, 1877.

SIR,

As a result of the Report of a Committee of the Treasury appointed to inquire into the conditions and mode of administration of the annual grant in aid of Meteorological Observations, a correspondence has for some time been going on between the Treasury and Royal Society relative to a reorganization of the Meteorological Office.

The scheme for the future conduct of the Office had been agreed on in its main features when a letter was received by the Royal Society, which was dated from the Meteorological Office, March 31st, and signed by all the members of the Committee, and which placed in the hands of the Council of the Royal Society the resignation of their offices in the Meteorological Committee, expressing at the same time a hope that it might be found convenient to act on that at an early date.

This letter was laid before the Council of the Royal Society at their meeting on the 12th April, when the following resolution was passed: —

"Resolved—That the best thanks of the President and Council be offered to the members of the Meteorological Committee for their labours, and they be requested to continue their services until the new arrangements contemplated by the Government shall be complete."

The final result of the further correspondence which has taken place between the Treasury and the Royal Society is, that the direction of the Office is placed in the hands of a body called the Meteorological Council, consisting of five members, including the Chairman, besides the Hydrographer of the Admiralty, who is a member *ex officio*. The names of the gentlemen who have been nominated by the Council of the Royal Society, and approved by the Lords Commissioners of the Treasury, to form, in conjunction with the Hydrographer, the new Council, are as follows: —

Professor H. J. S. SMITH (Chairman).
Mr. DE LA RUE.
Mr. F. GALTON.
Professor STOKES.
Lieut.-Gen. STRACHEY.

In the letter from the Treasury (dated June 28th, 1877), containing the final approval of the completed scheme, it is said: —

"My Lords assume that the new Council and the late Committee will arrange for taking over furniture and cash balances.

"No reference to the Treasury is necessary; but the transfers of accounts (only) should be so recorded as to enable the Comptroller and Auditor General to understand what has occurred."

On receipt of this letter Mr. White, by my direction, informed the members of the Meteorological Committee of the completion of the new scheme, and enclosed copy of the extract just quoted.

I am, &c.

(Signed) G. G. STOKES,
Secretary, Royal Society.

R. H. Scott, Esq., F.R.S.,
Meteorological Office.

42611. Wt. 5084.

In accordance with the instructions of the Treasury, the Council took over the office, furniture and fittings, cash balances, &c. from the Meteorological Committee.

The Chairman was requested to communicate with the permanent Secretary to the Treasury respecting the future relations of the Office with the Government.

The question of the constitution of the Council was then discussed, and the following resolutions were adopted :—

Resolved—

That in accordance with a correspondence which has taken place between the Council of the Royal Society and the Treasury, Mr. R. H. Scott be appointed Secretary of the Meteorological Council (instead of Director of the Office), at the same salary, 800*l.* per annum, as he has heretofore drawn as Director, and that all official correspondence be henceforth signed by him as "by order of the Meteorological Council."

That the full Council Meetings (unless otherwise appointed) be held on the first and third Wednesdays in each month (excepting August and September), at 3 p.m.

That three be a *quorum*.

That the salary of the Chairman be 300*l.* a year; that each of the non-official members of the Council receive a retaining fee of 50*l.* a year, and that the balance 500*l.* a year, be divided amongst the members of the Council (other than the Chairman) *pro ratâ*, according to the number of their attendances at meetings of the Council or of Committees of the Council.

That, if it shall be found possible, income tax be paid by the Office upon the whole sum of 1,000*l. per annum* appropriated to the payment of Chairman and Council.

That in case the Chairman should be unable to attend at any meeting he be allowed to appoint a Deputy Chairman, *pro hâc vice*.

The question of appointing a permanent deputy chairman was considered and deferred.

That the Chairman be a member of all Committees.

That a Committee be appointed to consider the future work of the Office in respect of Land Meteorology. The place of meeting to be at the discretion of the Committee. The Committee to consist of the Chairman, Mr. Galton, and Professor Stokes.

Submitted—Letter 1444 from the Board of Trade, enclosing copy of a letter from Mr. M. Bass, M.P., to that Board, suggesting that the Remarks on the Weather published in the daily newspapers might be rendered with advantage more interesting to the general public.

The Secretary was instructed to inform the Board of Trade that Mr. Bass's letter had been referred to the Committee on Land Meteorology.

Submitted—Applications for the supply of fishery barometers to—

Castle Townsend, co. Cork.
Coverack, Cornwall.

Sanctioned.

Read—Letter 1426 from George Freeth, prizeman in the training ship "Conway" in 1872, requesting the Committee to allow him to purchase a barometer with inscription, to replace that presented to him in 1872, which had been lost in a cyclone on its passage to him at San Francisco.

Purchase sanctioned.

Reported—That an imprest for 2,000*l.* had been applied for, June 28.—Application approved.

Submitted—The following abstract of accounts from April 1st, 1877, to June 30th, 1877 :—

Income.	£	s.	d.	Expenditure.	£	s.	d.
Balance from year 1876–7 - -	67	7	8	Office :—			
Vote for Year 1877–8:				Salaries and wages - -	356	15	6
Amount received - - £ 2,000				Rent, fuel, and lighting - -	137	5	0
Estimated amount due - 10,000				Incidental expenses - -	73	12	4
	12,000	0	0	Land Meteorology :—			
Weather information supplied for newspapers, &c. - - -	91	17	9	Observatories and other stations -	578	15	2
Repayments for telegrams, subscriptions to D.W. Charts, &c. -	249	1	5	Computations (reduction of observations) - - - -	309	3	3
Supply of data from ships' logs, &c.	2	15	0	Weather telegraphy - -	717	6	8
Sale of Instruments, &c.:				Computations - - -	322	1	5
Mercantile Marine account - -	17	19	0	Ocean Meteorology :—			
Royal Navy „ - -	8	4	0	Royal Navy:			
Observatory „ - -	7	10	0	Supply of instruments - -	32	0	11
Repayments of expenses charged under:				Other expenses - - -	18	16	7
(1.) Incidental expenses -	9	9	5	Mercantile Marine:			
(2.) Observatories, &c. -	3	19	4	Supply of instruments - -	111	1	6
Interest on deposit account - -	1	17	1	Other expenses - - -	55	6	5
Commission charged for work done for Colonies, &c. - - -	37	0	6	Computations (reduction of observations) and care of instruments -	403	10	9
Sundries - - - -	10	0	11		3,115	15	6
				Balance (amount available on 30th June) - -	9,391	6	7
Total - -	£12,507	2	1	Total - -	£12,507	2	1

Liabilities.	£	s.	d.	Assets.	£	s.	d.
To sundry creditors (partly estimated)	1,266	10	5	By cash in hand and on current account - - - -	89	10	11
„ balance of revenue account (as above) - - - - -	9,391	6	7	„ amount in hand at Valentia -	50	0	0
				„ sundry debtors - - -	518	6	1
				„ estimated amount due from H.M. Exchequer - - -	10,000	0	0
	£10,657	17	0		£10,657	17	0

The value of stock of instruments, &c. is not included in this statement.

Reported—That the following cheques for June were drawn on the 29th of that month, on the signature of Mr. De La Rue :—

		£	s.	d.
For Office:				
R. H. Scott -	Salaries and wages - - -	66	13	4
J. S. Harding, jun.		20	16	8
J. S. Harding, sen.		*9	12	6
T. D. Bell -		8	6	8
Williams and Norgate, books - - - - -		2	12	6
For Observatories, Quarterly Allowances, &c.:				
D. Thomson, Aberdeen - - - -	†61 8 2			
„ postages - - - -	1 13 3			
		63	1	5
Carried forward - - -		£171	3	1

* Five weeks to the 30th June.
† Deduction made for forms supplied.

				£	s.	d.
Brought forward				171	3	1
T. R. Robinson, Armagh	40	14	0			
,, expenses	11	0	4			
				51	14	4
W. P. Dymond, Falmouth				*65	12	6
R. Grant, Glasgow				*61	17	6
H. Williams, Holyhead				3	14	0
G. M. Whipple, Kew				100	0	0
C. Clouston, Orkney				2	10	0
G. H. Aird, Seaham				2	13	9
S. J. Perry, Stonyhurst				50	0	0
J. E. Cullum, Valentia	51	15	5			
,, salary	14	3	4			
				65	18	9
G. T. Watson, Yarmouth				4	0	6
R. H. Curtis				14	3	4
C. H. Thompson — Computations				† 8	0	0
E. G. Aldridge				† 6	5	0
J. A. Curtis				10	16	8

For Telegraphy, Quarterly Allowances, &c.:

W. McNeil, Ardrossan reporter	0	13	9			
,, for Ardrossan postmaster	0	6	6			
				1	0	3
H. Todd, Cambridge				4	11	6
J. Costello, Dover				3	6	0
J. Tilston, Holyhead				4	5	8
J. Curtayne, Killarney				1	5	0
G. Mitchell, Kingstown				3	5	9
F. Gaster, London				3	5	0
J. Lowry, Moville				6	0	6
W. D. Penny, Nairn				4	4	6
E. J. Lowe, Notts				3	18	0
J. Lucas, Oxford				3	7	0
J. Merrifield, Plymouth				3	5	0
W. Sandford, Portishead				3	19	0
J. C. Walker, St. Ann's Head				2	4	0
W. Thomas, Scilly				4	11	9
J. Smith, Stornoway				3	19	6
W. Brand, Sumburgh Head				1	13	9
J. Trotter, Thurso				3	6	3
J. Sinclair, Wick				3	6	0
G. T. Watson, Yarmouth				4	5	3
C. Wakefield, York				3	6	2
R. H. Scott, for Captain Hoffmeyer				9	4	7
F. Gaster				15	16	8
W. L. Dallas — Computations				10	0	0
F. Brodie				8	16	8
H. W. Chivers				†4	17	6

For Ocean Meteorology:

R. Riviere, labels for Charts				2	17	0
Pickford & Co., carriage, &c.				0	15	3
Street Brothers, advertisements				1	2	6
J. R. Jones, Aberdeen agent				5	7	3
Carried forward				749	12	8

* Deduction made for forms supplied.
† Five weeks to the 30th June.

	£	s.	d.
Brought forward - - -	749	12	8
P. Feathers, Dundee agent - - - - -	2	10	0
Z. Scaping, Hull agent - - - - - -	9	18	4
J. Gill, Liverpool agent - - - - - -	15	8	9
H. Toynbee - Computations - - - -	33	6	8
R. Strachan - Computations - - - -	*20	16	8
C. Harding - Computations - - - -	15	0	0
T. E. Allen - Computations - - - -	10	16	8
H. Harries - Computations - - - -	†9	12	6
Miscellaneous :			
J. J. Hicks, on account G. T. Kingston - - - -	1	13	6
H. Porter, „ „ - - - -	11	6	6
J. S. Harding, jun., on account - - - - -	160	0	0
	£1,040	2	3

* Including allowance for care of instruments.
† Five weeks to the 30th June.

The Council then adjourned till Monday the 23rd inst. at 3 p.m.

116, *Victoria Street, July* 23, 1877.

PRESENT:

PROFESSOR H. J. S. SMITH IN THE CHAIR.

MR. DE LA RUE.	THE HYDROGRAPHER.
MR. GALTON.	PROFESSOR STOKES.

The Secretary was in attendance.

The Minutes of last meeting (July 9) were read and confirmed.

Submitted—The following correspondence, in pursuance of the action directed at last meeting:—

SIR, July 13, 1877.

I HAVE the honour to inform you that the Meteorological Council, nominated by the President and Council of the Royal Society, and approved by the Treasury in your letter of June 28, have now entered on their duties, and have taken charge of the Meteorological Office.

The Meteorological Committee have always approached the Government through the Board of Trade, and their Minutes have been regularly sent to that Department.

I am requested by the Meteorological Council to ascertain from you whether it is the intention of the Government that the relations of the Meteorological Office to the Treasury and to the Board of Trade should continue unchanged.

I am, &c.

To R. R. W. Lingen, Esq., C.B. (Signed) HENRY J. S. SMITH,
&c. &c. &c. Chairman.

M.O. 1658.

SIR, Treasury Chambers, July 18, 1877.

I AM directed by the Lords Commissioners of Her Majesty's Treasury to acquaint you, in reply to your letter of the 13th instant, that any communications which the Meteorological Council may wish to make to the Government should, as heretofore, be addressed to the Board of Trade.

I am, &c.

(Signed) R. R. W. LINGEN.

The Chairman of the Meteorological Council.

The Secretary reported that he had arranged with the Collector of income tax for St. Margaret's parish, that the income tax on the lump sum of 750*l.* payable to the Council, may be paid by a cheque from the Office, considering the special circumstances of the case.

SUBMITTED—The following STATEMENT respecting the RECORDS for April 1877, received from the SELF-RECORDING OBSERVATORIES, which have been examined at the METEOROLOGICAL OFFICE (see Minutes 21st December 1868.)

——	Aberdeen.		Armagh.		Falmouth.		Glasgow.		Kew.		Stonyhurst.		Valencia.	
ANEMOGRAPH :—														
Action - - - - - -	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Fair.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Indifferent.	Direction. Good.	Velocity. Good.	Direction. Fair.	Velocity. Good.	Direction. Fair.	Velocity. Good.
Records deficient, due to stoppage of clock -	0	0	0	0	0	0	8 hrs.	9 hrs.	0	0	0	0	0	0
„ „ other causes - -	0	0	0	0	0	0	*8 hrs.	†15 hrs.	0	0	‡1 hr.	‡1 hr.	0	0
Orientation verified - - - -	30th	—	30th	—	17th	—	25th	—	13th	—	30th	—	30th	—
No. of errors discovered by subsidiaries -	0	0	0	0	0	1	0	9	0	0	0	2	0	1
„ „ irregular differences	0	0	0	0	0	0	0	0	0	0	2	0	0	1
Result of 40 *Remeasurements :—*														
Greatest difference - - - -	0	2·0	0	1·0	1·0	2·0	0	2·0	0	2·0	1·0	2·0	0	2·0
Mean difference irrespective of sign - -	0	0·6	0	·3	0	0·3	0	1·0	0	0·5	0·1	0·8	0	0·6
Residual difference (— Meteorological Office) -	0	—0·1	0	0·0	0	—0·1	0	—0·2	0	—0·1	—0·1	—0·1	0	—0·3
RAIN GAUGE :—														
Action - - - - - -	Good.		Good.		Good.		Good.		Good.		Good.		Good.	
Records deficient, due to stoppage of clock -	0		0		0		0		0		0		24 hrs.	
„ „ other causes - -	0		0		0		0		0		0		0	
Errors in tabulation - - - -	0		1		0		0		0		2		2	

BAROGRAPH :—

Action - - - - -	Good.	Good.	Good.	Good.	Good.	Good.	Good.
Photography - - - - -	Do.	Do.	Do.	Do.	Do.	Do.	Fair.
Records deficient, due to stoppage of clock -	0	0	0	0	0	0	0
„ „ failure of light -	0	0	0	0	0	0	0
„ „ other causes - -	0	0	0	§1	0	0	0
No. of errors discovered—							
In entry of standard - - -	0	0	0	0	1	5	0
„ calculating residual correction -	0	1	0	2	2	4	0
„ applying residual correction - -	1	1	0	‖28	0	2	1
„ subtraction in subsidiary tables -	0	0	0	0	2	1	1
„ tabulation by subsidiaries - -	0	0	0	0	0	0	0
„ „ irregular differences -	0	0	0	0	0	0	0
Result of 40 *Remeasurements :—*							
Greatest difference - - - -	0·007	0·006	0·005	0·005	0·006	0·006	0·006
Mean difference irrespective of sign - -	·0031	·0028	·0031	·0029	·0036	·0025	·0035
Residual difference (— Meteorological Office) -	—·0007	—·0007	+·0022	·0000	+·0002	·0000	—·0025
Mean monthly difference between simultaneous barograph and barometer readings - -	0·0014	0·0022	0·0021	0·0018	0·0025	0·0020	0·0016

THERMOGRAPH :—

Action - - - - -	Good.		Good.		Good.		Good.		Good.		Good.		Good.	
Photography - - - - -	Do.		Do.		Do.		Do.		Do.		Do.		Fair.	
	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
Records deficient, due to stoppage of clock -	0	0	0	0	0	0	0	0	1	1	0	0	0	0
„ „ failure of light -	0	0	0	0	0	0	0	0	0	0	0	0	0	0
„ „ imperfectly moistened bulbs - -	—	0	—	4	—	23	—	0	—	0	—	1	—	0
„ „ partially frozen -	—	11	—	0	—	0	—	4	—	0	—	0	—	0
„ „ other causes - -	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of errors discovered in entry of standard -	1	0	0	0	0	0	0	0	0	3	2	1	0	2
„ „ by subsidiary measurements -	0	0	0	0	0	0	0	0	0	0	0	0	0	0
„ „ of subtraction in do. tables -	0	0	0	0	0	0	0	2	4	5	0	0	6	0
„ „ detected under glass scale -	2	2	0	0	2	0	1	3	22	5	2	2	0	4
Result of 40 *Remeasurements :—*														
Greatest difference - - - -	0·2	0·3	0·2	0·2	0·3	0·3	0·2	0·2	0·5	0·5	0·3	0·3	0·3	0·3
Mean difference irrespective of sign - -	·10	·05	·07	·07	·11	·07	·09	·09	·22	·16	·10	·07	·12	·13
Residual difference (— Meteorological Office)	—·09	—·01	+·02	+·02	—·03	—·02	—·07	—·03	—·21	—·12	—·06	·00	+·04	+·08
Mean monthly difference between simultaneous thermograph and thermometer readings -	0·15	0·17	0·14	0·21	0·09	0·10	0·19	0·11	0·15	0·15	·13	0·17	0·13	0·32
No. of errors in maxima and minima - -	1	—	2	—	2	—	1	—	5	—	3	—	2	—

* Trace too faint to tabulate. † Owing to an accident to velocity pencil. ‡ Painting instrument. § Owing to blemish on curve. ‖ Throughout one day the correction was applied as — instead of +

The question of Sunday Telegraphy was taken into consideration, and it was resolved—That the service of Sunday Telegraphy be resumed on the same plan as prior to April 30, for the remainder of the present financial year.

The Secretary was instructed to carry out the inspection of the stations in the United Kingdom as in previous years, and to request the Kew Committee to allow Mr. Whipple to inspect the Observatories. The present system therefore to be maintained provisionally for 1877.

It was agreed that a paper of suggestions as to scientific investigations should be prepared and circulated amongst the members of Council.

With reference to Ocean Meteorology the Secretary at the request of the Hydrographer submitted the following Memorandum:

MEMORANDUM respecting the discussion of Marine Meteorological Observations for the Cape of Good Hope District, as mentioned in the *Report of the Office* for 1876.

The number of days' observations *already extracted* into the data books for the Cape of Good Hope district (Lat. 30° to 50° S. Long. 10° to 40° E.) is 4,880. These observations have been obtained from 259 logs; the last log extracted is No. 1,050.

The number of days' observations estimated *to be extracted* from logs now in Office is 12,000; the receipt of documents while work is proceeding will raise the number of days *to be extracted* to about 13,000.

It is estimated that the present staff of the Marine Room will have completed the extraction from Office logs into data books by the end of August 1878. The work will then be ready for summing and meaning, &c. and probably the charting, &c. could be carried on simultaneously with the work of obtaining mean results.

This estimate does not reckon upon any of Mr. C. Harding's time being devoted to the extraction work, his time being fully occupied in supervision and extraneous duties.

July 25, 1877.

It was further resolved—That Capt. Toynbee be requested to communicate with the Hydrographer on the above subject.

The proof of the Barometer Manual (Minutes 1876, p. 75) was submitted with certain correspondence between the Hydrographer and Mr. Scott (Letters 1513, 1548, 1618, *received*, and 1375, 1380, 1484, and 1479, *written*,) and the Hydrographer made a verbal statement.

It was resolved—That the book be issued by the authority of the Council, and that the Chairman, after conference with the Hydrographer, should suggest some alterations in the Manual prior to its publication.

The Secretary reported—That he had received a letter (No. 1634) from Professor Cantoni stating that the proposed Meteorological Congress at Rome, for September next (Minutes 1877, pp. 20, 21, and 33) had been postponed till 1878. (See also Letter 1718, from the Board of Trade on the same subject.)

Submitted—The following correspondence (Minutes 1877, p. 33).

M.O. 1607.

SIR, Board of Trade, July 11, 1877.

I AM directed by the Board of Trade to transmit herewith a copy of a further despatch from the Governor of Heligoland, relative to the establishment of a meteorological station at that island.

With reference to that part of Governor Maxse's despatch, suggesting that the expense of providing the island with the necessary instruments, &c. should be borne by this Department, I am directed by the Board of Trade to state for your information that they have no funds at their disposal for any such purpose.

I am, &c.

The Director, Meteorological Office. (Signed) THOMAS GRAY.

M. 8996.

MY LORD, Heligoland, June 23, 1877.

I BEG respectively to draw your Lordship's attention to the enclosed correspondence, being copies of papers forwarded to me in your Lordship's despatch of the 9th December 1876, in answer to mine numbered 27 of the 8th of September, and referring to the establishment of a meteorological station at Heligoland.

2. The question has again been mooted, on the occasion of the approaching erection of a self-registering tide measurer at Heligoland.

3. Dr. Neumayer, director of the German Meteorological Department, states, in answer to my inquiries, as to why so large a difference in price exists between the outfit of English stations, and that proposed by him for adoption at Heligoland, that amongst other things, the anemometer alluded to as costing 5*l.*, in the letter from the Meteorological Department cannot be a self-registering instrument.

4. Dr. Neumayer touches on other points of expense, but it is unnecessary that I should trouble your Lordship further on this head, as I am of opinion (after having been further informed privately on the subject by the kindness of Mr. Scott, of the Meteorological Department) that the instruments as supplied to the Meteorological Offices in Great Britain will be sufficient for us here.

5. As regards the mast to which the Board of Trade refer, we shall be able to erect one of sufficient efficiency, as no night signal station is proposed, for under 10*l.* instead of 60*l.*, as named by Dr. Neumayer.

The necessary drum and cones would be over and above the estimate stated.

6. Mr. Schmidt (a teacher of the Colonial school) who will have charge of the self-registering tide measurer about to be established here, will be satisfied with the remuneration mentioned by the Meteorological Department, viz., 13*l.* per annum, and this latter annual charge I propose to meet from Colonial funds.

7. Perhaps, therefore, as this was formerly a Meteorological Station in Admiral FitzRoy's time, and as Heligoland is generally admitted to be peculiarly adapted for such purposes, the Board of Trade might favourably consider the request to present us with the necessary instruments, mast and signals, to start with, the more so as the benefit arising will be much more considerable for shipping in general than for local purposes.

8. Should the Meteorological Department desire certain weather reports to be forwarded telegraphically, they will, I doubt not, defray the expense of such telegrams, as was the case during the existence of a similar station here under Admiral FitzRoy.

9. On the other hand, I understand that the German Government is prepared to pay for the weather reports telegraphed to Hamburg.

I have, &c.

The Right Honourable the Earl of Carnarvon. (Signed) FITZMAXSE.

It was resolved—That the operations of the Council be for the present confined to the British Isles and British ships, and that in accordance with the foregoing resolution, the application from Heligoland be not acceded to.

The Secretary was instructed to write to the Board of Trade accordingly.

Submitted—The Quarterly Weather Report for 1874, Pt. IV., with the following Memorandum:

SIR July 23rd, 1877.

I BEG to lay before you a table, showing the results of the measurements made to check the accuracy of the 19 plates contained in the Fourth Part of the Quarterly Weather Report for 1874, which has just been published.

I ought to state that the measurements have been made at 6 a.m., noon, 6 p.m., and midnight, from proofs pulled on *dry* paper, to avoid error from shrinkage, and have been compared with the tabulations of the original curves.

It will be seen that in the case of the temperature curves 83°/₀ of the differences do not exceed ·2, and only 1°/₀ exceeds ·5; whilst with the barometer 73°/₀ are within 5 thousandths, and ·01 is exceeded on 15 occasions only in 2756 measurements.

This degree of accuracy is mainly the result of better methods of treating the curves brought about by experience gained in the work.

I am, &c.

R. H. Scott, Esq. R. H. CURTIS.

MEASUREMENTS of PROOFS, Fourth Quarter, 1874.

Differences. (Barometer in thousandths. Thermometer in tenths.)

No. of Plate.	——	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	No. of Measurements.	Means.
															ins.
55	Barometer -	9	19	16	18	23	20	17	11	7	3	2	1	146	0·004
	Dry - -	43	58	21	10	5	7	1	2	–	–	–	–	147	0°·14
	Wet - -	47	63	17	11	3	4	1	–	–	–	–	–	146	·12
56	Barometer -	17	26	17	23	16	19	9	2	6	5	3	2	145	·0035
	Dry - -	39	36	39	22	4	5	–	–	–	–	–	–	145	·15
	Wet - -	35	48	32	18	5	5	1	–	–	–	–	–	144	·15
57	Barometer -	9	21	19	20	20	17	17	7	10	4	3	–	147	·004
	Dry - -	32	56	34	18	5	2	–	–	–	–	–	–	147	·14
	Wet - -	46	51	32	11	2	3	–	–	–	–	–	–	145	·12
58	Barometer -	6	20	18	19	19	19	15	9	14	5	1	2	147	·004
	Dry - -	42	51	28	19	4	2	1	–	–	–	–	–	147	·13
	Wet - -	41	59	27	12	4	3	1	–	–	–	–	–	147	·13
59	Barometer -	12	23	18	18	20	16	19	12	2	5	1	–	146	·0035
	Dry - -	33	49	33	11	11	5	5	–	–	–	–	–	147	·17
	Wet - -	50	46	26	15	7	2	–	1	–	–	–	–	147	·13

No. of Plate.	——	0.	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	No. of Measurements.	Means.
60	Barometer -	8	21	16	21	21	25	13	8	8	5	1	–	147	·004
	Dry - -	33	57	36	16	4	1	–	–	–	–	–	–	147	·14
	Wet - -	40	48	28	22	4	3	–	–	1	1	–	–	147	·15
61	Barometer -	12	25	18	14	15	18	11	15	11	7	1	–	147	·004
	Dry - -	31	51	39	22	1	2	–	1	–	–	–	–	147	·15
	Wet - -	26	46	39	23	8	4	–	–	–	–	–	–	147	·17
62	Barometer -	10	23	21	16	10	23	17	4	5	6	2	1	146	·004
	Dry - -	35	49	33	18	11	–	1	–	–	–	–	–	147	·15
	Wet - -	30	54	35	20	6	1	1	–	–	–	–	–	147	·15
63	Barometer -	13	24	19	17	14	19	12	14	7	5	2	–	146	·004
	Dry - -	44	38	34	18	9	4	–	–	–	–	–	–	147	·14
	Wet - -	38	58	26	18	3	2	–	–	–	–	–	–	145	·13
64	Barometer -	11	24	21	16	10	20	17	14	5	8	1	–	147	·004
	Dry - -	27	51	39	18	5	7	–	–	–	–	–	–	147	·16
	Wet - -	28	56	34	17	11	1	–	–	–	–	–	–	147	·15
65	Barometer -	9	31	28	23	16	12	14	5	4	2	1	2	147	·003
	Dry - -	33	65	26	14	4	2	2	–	–	1	–	–	147	·14
	Wet - -	42	62	27	10	3	1	–	–	–	–	–	–	145	·11
66	Barometer -	11	28	24	14	15	13	11	9	8	9	3	–	145	·004
	Dry - -	43	58	32	8	2	4	–	–	–	–	–	–	147	·12
	Wet - -	47	56	27	10	3	–	–	–	–	–	–	–	143	·10
67	Barometer -	10	32	16	15	16	16	14	8	10	8	–	–	145	·004
	Dry - -	44	43	38	10	9	2	1	–	–	–	–	–	147	·14
	Wet - -	43	46	32	16	7	1	–	–	–	–	–	–	145	·13
68	Barometer -	12	23	18	12	19	17	11	18	8	8	–	1	147	·004
	Dry - -	35	55	28	13	9	7	–	–	–	–	–	–	147	·14
	Wet - -	39	46	36	16	5	2	–	1	–	–	–	–	145	·14
69	Barometer -	15	18	19	23	14	11	9	23	5	3	3	2	145	·004
	Dry - -	43	47	31	20	4	2	–	–	–	–	–	–	147	·13
	Wet - -	36	59	31	11	1	1	–	–	–	–	–	–	139	·12
70	Barometer -	11	24	21	16	10	20	17	14	5	8	1	–	147	·004
	Dry - -	41	60	21	17	4	2	–	–	–	–	–	–	145	·13
	Wet - -	55	56	25	3	1	1	–	–	–	–	–	–	141	·10
71	Barometer -	15	30	25	18	11	8	13	8	4	11	1	2	146	·0035
	Dry - -	20	48	41	23	10	5	–	–	–	–	–	-	147	·18
	Wet - -	29	55	33	13	5	2	1	–	–	–	–	-	138	·14
72	Barometer -	8	18	26	22	13	20	10	5	10	3	1	1	137	·004
	Dry - -	29	52	36	19	4	3	–	–	–	–	–	–	143	·15
	Wet - -	37	53	33	11	3	1	–	–	–	–	–	–	138	·12
73	Barometer -	17	24	17	20	12	14	10	9	4	4	1	1	133	·0035
	Dry - -	36	52	33	19	2	–	–	1	–	–	–	–	143	·13
	Wet - -	40	58	27	5	6	–	–	–	–	–	–	–	136	·11

Per-centages of Baro. Differences.

0·000	·001	·002	·003	·004	·005	·006	·007	·008	·009	And above ·010.
%	%	%	%	%	%	%	%	%	%	%
8	16	14	13	10	12	9	7	5	4	2

Per-centages of Thermo. Differences.

...	0·0	·1	·2	·3	·4	·5	Above ·5
	%	%	%	%	%	%	%
Dry - -	25	35	23	11	3	2	1
Wet - -	35	37	20	10	3	1	2

The Secretary was instructed to have the above Memorandum distributed to all the recipients of the part in question.

The question of continuing the Quarterly Weather Report in its present form was considered.

The question of printing Capt. Toynbee's Lecture on the Storm of August 24, 1873, (Minutes 1877, pp. 41, 45,) was taken into consideration, and it was resolved that as the Lecture is a summary of work done in the Office, the sum of 10*l.* be allowed towards the cost of illustrating it in the Nautical Magazine, (as proposed, p. 41) on condition of the Office being allowed to purchase copies at a reduced rate.

The Secretary drew the attention of the Council to the condition of the Anemograph at Bermuda, which had been erected in 1859, and was not now performing in a very satisfactory manner, and read a letter from Major-General Sir. J. H. Lefroy, K.C.M.G., (No. 1,672) on the subject.

Resolved—That the Anemograph at Bermuda be sent for in order to be examined at home.

Reported—That an imprest for 1,050*l.* had been forwarded by the Treasury (Letter 1,636) and lodged to the credit of the Council.

Reported—That instruments had been ordered on the Admiralty account value	- - - - - - -	£68	15 0
Board of Trade	- - - - - - -	98	15 0

Approved.

The following cheques were drawn :—

July 13.	J. S. Harding, Jun., Office expenses	- - -	50	0 0
„ 23.	C. W. Jacques, rent of Office	- - - -	133	13 0
	J. O'Driscoll „ at Valencia	- - - -	25	0 6
	Postmaster-General, telegrams for April	- - -	164	17 2
	J. S. Harding, for petty cash	- - - -	40	0 0
			£413	10 8

The Council then adjourned.

116, *Victoria Street, October* 3, 1877.

PRESENT:

PROFESSOR H. J. S. SMITH IN THE CHAIR.

THE HYDROGRAPHER.	MR. GALTON.
GENERAL STRACHEY.	PROFESSOR STOKES.

(The Secretary was absent, by permission, on inspection duty.)

The Minutes of the last meeting (July 23) were read and confirmed.

The Report of the Committee on Land Meteorology was read, and ordered to be printed.

The Committee on Land Meteorology met at the Meteorological Office July 24th, 1877.

Present: Professor H. J. S. Smith, Chairman.
Mr. Galton and Professor Stokes.

The Secretary was in attendance.

The subject of the Quarterly Weather Report was taken into consideration, and it appeared that the cost to the Stationery Office of the volume for 1874, which has just been issued, has been 390*l.*, while the expense to the Office in salaries to the clerks employed on Pantagraphic work has been 35*l.* for the year 1876. It appeared further that the work of engraving the plates for 1876 had not been commenced, while those for 1875 would be completed in a very short time. As the time of the Pantagraphic Room could be advantageously occupied in the month of September it was resolved "that the preparations for the Quarterly Weather Reports for 1876 be discontinued until October." With reference to Agricultural Meteorology, it was resolved that Mr. Galton be requested to prepare a draft form for supplying information as to weather for Agricultural purposes, and that as soon as the form is settled Mr. Scott be requested to commence the publication in such way as he should find most advantageous.

With reference to Sanitary Meteorology, it was resolved that a letter be sent to the Local Government Board referring to the note at foot of page 63 of Treasury Report, and stating, on behalf of the Council, that they are in a position to supply to the General Registry Office and to the Medical Department of the Local Government Board certain Meteorological information, as shown in the Quarterly Returns of the Registrar General for Ireland, and from any of the stations given in the subjoined list.*

And that they would be glad to learn if there be any other particulars with respect to which information would be required by either of the Departments named.

The subject of the appointment of Inspectors was then considered, and it was agreed that it is desirable to obtain for the Council the services of Mr. Buchan for Scotland as their Agent and Inspector, and that if it should appear that Mr. De La Rue and the Hydrographer approve of this and the two following proposals, the Chairman be authorised to communicate with Mr. Buchan.

That the salary offered to Mr. Buchan be 150*l.* a year exclusive of travelling expenses. Salary to commence on October 1st.

That Mr. Buchan's duties as Inspector and Agent be to inspect any stations in Scotland that are at present or may hereafter become connected with the Office, at such times and in such manner as the Council may direct, and to act as intermediary between the Council and the observers in Scotland from whom the Council may wish to obtain Meteorological information, and generally to promote the work of the Meteorological Office, so far as it relates to Scotland.

That Mr. Buchan be not expected to begin his full duties as Inspector till 1878, but that he be requested to visit London early in October next for the purpose of meeting the Council and acquainting himself with the work of the Office and with that carried on at Kew.

The Secretary submitted the Circular adopted by the Committee March 11, 1867 (Minutes 1867, page 27), and stated that hardly a single place had ever made application for information on the condition therein mentioned of defraying half the cost of transmission.

He was authorised to withdraw the Circular.

The Committee then adjourned.

The Chairman stated that having received the approval of the two members above named, he had acted in accordance with the foregoing Report, and he read the following letter which he had written to Mr. Buchan :—

SIR, July 31, 1877.

I AM requested by the Meteorological Council to inform you that they are desirous of obtaining your services as their Agent and Inspector for Scotland; and to forward to you the enclosed extract from their Minutes, which may serve to explain the nature of the work which they wish you to undertake for them, and the conditions under which it would be begun and carried on.

The Council are induced to make this proposal to you, at the very commencement of their official existence, by the strong sense which they entertain of the important services which you have rendered to Meteorological Science, and by the hope that the office which they offer to you may enable you to extend the sphere of your usefulness without in any way interfering with the work in which you are already engaged.

I have, &c.
(Signed) HENRY J. S. SMITH,
Chairman of the Meteorological Council.

To A. Buchan, Esq., F.R.S.E.

And also the following reply :—

M.O. 1918. Scottish Meteorological Society, General Post Office Buildings,
SIR Edinburgh, August 30, 1877.

IN my letter of August 2, I explained to you that it was necessary I should obtain the sanction of my Council before accepting the offer which you were so kind as to make me in your letter of July 31st, as my whole time is at their disposal. Being desirous of answering your letter before leaving for Upsala to-morrow, I endeavoured to have a meeting of Council, but have not succeeded nearly every one of the members being, as usually happens at this season of the year, from home.

I have, however, consulted several members of Council, who have taken upon themselves to say that they will not allow anything to stand in my way in this matter. Of course they are unaware, as I am myself, what is expected of me as your Inspector and Agent, but they have kindly stated that they will endeavour to take means to get such additional assistance in the Office as may be necessary to enable me to discharge the duties of the Office.

Under these circumstances I have much pleasure in accepting the appointment, and I have not only to express my appreciation of the honour which has been done me by the Meteorological Council, but I have to return my best thanks to you for the kind manner in which you have been pleased to offer me the appointment.

I shall be ready to go to London as requested in October next.

I am, &c.
(Signed) ALEXANDER BUCHAN.

Professor H. J. S. Smith,
Chairman of the Meteorological Council.

Resolved—That that part of the report of the Committee on Land Meteorology which relates to the appointment of Mr. Buchan be confirmed.

* Not printed here.

The Chairman read the following letter which he had received from the Astronomer Royal:—

M.O. 1779. Royal Observatory, Greenwich,
1877, August 2.

DEAR SIR,

REFERRING to your position as Chairman of the Meteorological Council lately constituted, I am anxious to communicate to you my readiness to confer with you as to the arrangements by which the Meteorological Department of this (the Royal) Observatory can best be made subservient to the wants of the Meteorological Council.

Our general establishment of Meteorological apparatus and system of use are, I believe, among the best in the world; and it will be of much pleasure to me to receive your suggestions regarding observations, reductions, and communication, and to do my best to carry them out efficiently.

The present opportunity appears to be a favourable one for placing this matter on a footing which will be advantageous to the purposes of the Committee, and will be justly economical to the Government.

I am, &c.
G. B. AIRY.

Professor H. J. S. Smith,
Chairman of the Meteorological Council.

The Council requested the Chairman to confer with the Astronomer Royal as suggested by him.

The Council proceeded to consider the following Paper of Suggestions for Researches, which had been prepared in accordance with a resolution at the last meeting.

SUGGESTIONS for RESEARCHES to be undertaken by the METEOROLOGICAL COUNCIL.

I. On the measurement of the height of clouds, and the direction and rate of their movements, by two or more vertical cameras at measured distances apart, taking simultaneous photographic pictures at successive intervals of time. The instruments, appliances, and tables to be constructed, and the whole process to be experimentally methodised.—[*Mr. Galton.*]

II. An investigation into the conditions by which labour may be economised in producing Charts of Ocean Meteorology, having regard (1) to the number of observations desirable; (2) the degree of carefulness to be exacted in making them; (3) the best methods of combining them and deducing synoptic mean results.

The following notes refer to some after points which would have to be attended to in this investigation:—

The large number of observations collected and sorted in the data books for the discussion of the Ocean Square 3, and for the eight squares adjacent to it, enable investigations to be made that might give important indications as to the courses by which labour would be best economised in discussing other parts of the ocean.

As regards the number of observations advisable to collect, we know that they soon accumulate beyond the power of making good use of them. The mean temperature, or other element, of a given month in an ocean square, is not a real definite quantity like a physical magnitude, but is itself variable in an abrupt way, according to laws far more complex than we can hope ever to calculate. Hence the mean temperature, &c. is incapable of exact definition, and the questions arise (1) what degree of exactness is it really worth aiming at; (2) how many ship observations appear necessary to secure that and other degrees of exactness. An analysis of the above-mentioned data would give much practical insight into the matter.

In taking mean values that are intended to refer to the centre of an ocean square on the middle day of a given month, we ought to combine the various observations taken near in geographical position to that centre, and near in time to that day, allowing greater weight in proportion to their vicinity (or some function of it). The method adopted at present is to throw together all the observations taken during the month in a single group, and to take the mean of the whole of them. Would not greater refinement of operations give much better results, so that there might be economy of labour in the end, by making fewer observations necessary?

Investigation into the above-mentioned data would greatly elucidate this.

Is it worth while to weight the observations on board ship? They are at present treated exactly alike, although for purposes of discipline and inspection the logs are carefully classified into "excellent," "good," &c. This question has been theoretically considered by the Meteorological Committee in 1876 (Minutes, 1876, pp. 18, 26, and 36), and several answers to a circular letter by Mr. Galton were received and printed; also the Astronomer Royal has given a revised opinion on the subject before the Treasury Committee (C. 1638, p. 51, 928). It is much to be desired that the above-mentioned data should be so discussed as to give a practical answer to the question.

As to the undue preponderance of some observations, vessels passing through an ocean square remain longer in it, and therefore record more observations when the wind is contrary than when it is favourable. Consequently in squares frequented mainly either by homeward or by outward bound ships, an undue prevalence is apt to be assigned to winds opposing their usual course, and *vice versâ*. Is this in any case a serious objection to the present method of treating observations, and how should the difficulty be best remedied?

In constructing Current Charts, the practice of the Office has not been to take the mean of all the currents and their rates observed in the ocean square during the period under discussion, but to draw current "roses." These are figures that express the relative amount of observed drift towards

the several points of the compass. For example, if a current set as often and as strongly East as West during the month, the results would not be allowed to neutralise one another, but arms pointing East and West would be drawn of the same length. Notwithstanding the convenience of this idea, it is practically open to a serious objection, owing to the errors of observation (which are apt to be exceedingly large in the case of currents) not tending to neutralise one another. Thus, suppose no current at all, all errors that appeared to indicate an east current, and all those that indicated a west current would remain, and so for all other directions, consequently the current "rose" in the supposed case would be a circle, whose radius would be equal to the "probable error" of a single observation, which is perhaps as much as 10 or 15 miles. On what principle ought the current roses to be drawn, in order to eliminate as far as may be the difficulty indicated by these remarks? There is no doubt that a large part of the recorded currents are in reality nothing more than errors of observation.—[*Mr. Galton.*]

III. An analysis and classification of the weather of the British Isles in those instances where forecasts were not justified by the events.—[*Mr. Galton.*]

IV. Investigation and classification of those forms or types of weather that are of frequent occurrence in the British Isles.—[*Mr. Galton.*]

V. To devise and construct an instrument to be attached to a pier-head whereby the data for calculating the amount of sea disturbance may be automatically registered, together with tables for making the necessary computations, having regard to the effect of a shallow sea upon the form of the waves.– [*Mr. Galton.*]

VI. A comparison of the curves of continuously self-recording instruments at neighbouring stations, such as Kew and Greenwich, or even at a distance of a few hundred yards apart, with the view of ascertaining how far their more minute variations may be due to local causes of very limited extent, and how far they may express meteorological conditions prevailing over a considerable area.—[*Mr. Galton.*]

VII. To determine, by chemical means, the amount of moisture in the air under different circumstances, and compare it with the records of the ordinary hygrometric instruments.—[*Professor Stokes.*]

VIII. Possibility of employing a signalling Anemometer.—[*Dr. De La Rue.*]

IX. Proposal by Professor Everett to deal with the Kew Observations on Atmospheric Electricity

EXTRACT from a LETTER by Professor EVERETT, M.O. 486, February 19, 1877

"Since the old observations were reduced under my superintendence there has been a gap of 10 years; the new observations were begun in the beginning of 1874 and have been continued to the present time with two interruptions, one of about a month in 1875 and the other of six months in 1876. Interruptions of this kind are very unfavourable for the application of Sir W. Thomson's favourite system of reduction—harmonic reduction. But there is one way in which the results might be presented that would be very instructive, and would be completely novel as regards its application to atmospheric electricity—the plan which you have adopted with so much success for other meteorological elements. If you would put the curves of electricity along with the other curves for Kew, we should have such an opportunity as has never yet been given for detecting the correspondence between electrical variations and the variations of other elements. The most convenient plan for the reader would be to have a year's curves for Kew printed in a book by themselves, but if this would involve too much extra expense, the electrical curve could be simply introduced along with the other curves for Kew in your regular Quarterly Reports." * * (Signed) J. D. EVERETT.

X. Application of Harmonic Analysis to barometrical and other meteorological observations.—[Evidence of Sir William Thomson in the Report of the Treasury Committee, pp. 94–99.

The Council proceeded to deal with the suggestions of this Paper seriatim:—

No. I.—Mr. Galton and Professor Stokes having made certain definite suggestions on the subject, it was resolved that they be requested to confer together, and that the sum of 20*l.* be placed at their disposal for preliminary trials if they think expedient.

Nos. II., III., IV.—Consideration postponed.

No. V.—Plans for carrying out this object were submitted by Mr. Galton and Professor Stokes, and the further consideration of the subject was postponed.

No. VI.—The Chairman was requested to apply to the Astronomer Royal for the loan of certain photographic meteorological records, with a view to a comparison with those simultaneously taken at the Kew Observatory.

No. VII.—After some discussion this question was postponed.

No. VIII.—Postponed on account of the absence of Dr. De La Rue.

No. IX.—The Secretary was directed to prepare an estimate of the cost of preparation and publication of a year's electrical registers obtained at Kew.

No. X.—Consideration postponed.

Captain Toynbee brought to the notice of the Council "excellent" Logs by

Captain W. Watson, s.s. "Algeria" (Minutes 1876, p. 135).
„ W. Barron, s.s. "Sultan."

It was resolved that the thanks of the Council be given to Captain Watson and Captain Barron, and that a copy of the Charts (O. 27) be presented to Captain Barron.

The consideration of suggestion No. II. was entered on, and it was resolved—That Captain Toynbee be requested to supply the Hydrographer such of the data books for one of the squares as he may require to enable him to prepare a model chart to illustrate the system of graphic representation which he proposes.

The Council then adjourned.

116, *Victoria Street, October* 17, 1877.

PRESENT:

PROFESSOR H. J. S. SMITH IN THE CHAIR.

MR. GALTON.	PROFESSOR STOKES.
THE HYDROGRAPHER.	LIEUT.-GENERAL STRACHEY.

The Secretary was in attendance.

The Minutes of last meeting (October 3) were read and confirmed.

Submitted—The following correspondence in accordance with the Report of the Committee on Land Meteorology (paragraph II.) :—

SIR, Meteorological Office, August 1, 1877.

I AM instructed by the Meteorological Council to inform you that in accordance with section 20 of the "Report of the Treasury Committee appointed to inquire into the conditions and mode of administration of the Annual Grant in aid of Meteorological Observations" (C. 1638 of 1877), they are prepared to furnish to your Office meteorological information for the various returns specified in a letter from the Registrar General to the Secretary of the Royal Society, of December 17th, 1872, and also for the Medical Department of your Board, in case that Office should require such information.

A note appended to Dr. Farr's evidence (p. 63 of the Report above quoted, appears to the Council to convey the impression that at that period (March 1876) the Registrar General thought that the Meteorological Committee were not in a position to supply him with the information in question "in the required time."

A reference however to my letter to the Registrar General of January 7th, 1873, shows that no difficulty whatever was then anticipated by this Office on that score, nor is any probable now.

I am desired to assure you that the Council are ready to supply you gratuitously with trustworthy information for the Quarterly Returns of the General Register Office within the required time, from any of the subjoined list of stations, 37 in number, which are in direct connexion either with this Office or with the Meteorological Society, and whose number can be easily increased.

As to the Weekly Returns the Office has no existing arrangements to supply them, but the Council have no hesitation in saying that they can at once organize a system of reports from centres of population which will be similar to that now in connexion with the General Register Office.

I enclose maps showing position of the stations and a copy of the Quarterly and Weekly Returns now supplied by us to the Registrar General for Ireland.

I am, &c.

(Signed) ROBERT H. SCOTT,
Secretary.

The Right Hon. G. Sclater-Booth, M.P.,
President Local Government Board.

The stations are arranged in order of latitude, north to south.

Seaham.	Nottingham.	Chigwell Row (Essex).
Durham.	Hillington (Norfolk).	Norwood.
Hawes.	Shrewsbury.	Marlborough.
Stonyhurst.	Norwich.	Chatham.
Hull.	Leicester.	Ramsgate.
Wakefield.	Uppingham.	Strathfield Turgiss (Hants).
Prestwich (Lancashire).	Mellington Hall (Monmouthshire).	Folkestone.
Kelston (Lincolnshire).	Oscott.	Hastings.
Bidston.	Hereford.	Hurst Castle.
Llandudno.	Audley End (Essex).	Dartmoor.
Buxton.	Caermarthen.	Babbicombe.
Mansfield.	Oxford.	Falmouth.
Cheadle.		Jersey.

M.O. 1901.
No. 55,394 C.C. 1877.

SIR, Local Government Board, August 27, 1877.

I AM directed by the Local Government Board to acknowledge the receipt of your letter of the 1st instant, in which, by direction of the Meteorological Council, you state that in accordance

with Section 20 of the Report of the Treasury Committee appointed to inquire into the conditions and mode of administration of the "Annual Grant in aid of Meteorological Observations" (C. 1638, 1877), they are prepared to supply the Board with Meteorological information for the various returns specified in a letter from the Registrar General to the Secretary of the Royal Society, of December 17th, 1872, and also for the medical branch of the Board, in case that department should require such information. You also furnish the Board with the observations of the Council, on the subject of the note appended to the evidence of Dr. Farr in the report referred to.

In expressing the Board's thanks for the offers of the Meteorological Council, I am to state that the Board have been in communication with the Registrar General, who informs them that he does not think it desirable to disturb the arrangement existing between the Astronomer Royal, Mr. Glaisher, and himself for obtaining returns and remarks as to meteorology for publication in his Weekly, Quarterly, and Annual Returns. He states that he considers the information so obtained, and which is supplied to him free of cost, sufficient for the purposes of those Reports, and that he is therefore not prepared at present to accept the offer made in your communication.

As regards the Medical Department of the Board, I am to state that the Meteorological statements published by the Registrar General satisfy the every-day requirements of that Department. At the same time the Board believe that the information which will come into the possession of the Meteorological Office cannot fail to possess importance for the Medical Department, first as serving occasional purposes from time to time, and secondly, as laying up store of facts for use in the future. But such information being of the nature of record or reference, and not being required for every-day use, need not be supplied to the Board periodically, but only as the occasion for it may arise. Whilst therefore the Board will not trouble the Meteorological Council to furnish them with regular returns, as proposed, they will be glad to have access to the information which the Council may collect.

I am, &c.
(Signed) J. F. ROTTON,
Assistant Secretary.

Robert H. Scott, Esq., F.R.S.

Reported—That the supplementary estimate for the Office of 2,000*l.* had been passed on August 7th, and that on the 1st of that month the usual application for the total amount due on the vote for the year 1877–8 had been forwarded to the Treasury.

On this application the following correspondence had arisen :—

M.O. 1864.

SIR, Treasury Chambers, August 18, 1877.

IN reply to your letter of the 1st instant asking that 6,950*l.* may be issued to you, in respect of the Parliamentary grant for Meteorology for 1877–8, I am directed by the Lords Commissioners of Her Majesty's Treasury to request you to suggest to the Meteorological Council that, adverting to recent increase of the grant, their requirements might now be limited to even quarterly sums. Hitherto, no doubt, it has been usual to issue the whole of this particular grant shortly after it had been voted. But the ordinary and more convenient practice is to spread the issue of a grant over the year.

My Lords propose that the balance of the grant for the current year, amounting, with the supplementary vote of 2,000*l.* to 8,950*l.*, should be issued as follows :—

3,000*l.* at once (authority has been given to the Paymaster-General accordingly) ;
3,000*l.* in October, and
2,950*l.* in January.

In future years the grant would be issued in equal quarterly instalments in the first month of each quarter.

Of course, if the immediate introduction of the proposed arrangement would put the Council to any serious inconvenience, my Lords will be prepared to reconsider it.

I am, &c.
(Signed) WILLIAM LAW.

The Secretary, Meteorological Office.

P.C. 1713.

SIR, Meteorological Office, August 20, 1877.

I HAVE the honour to acknowledge the receipt of your letter of the 18th instant (No. 12830/77), which shall be brought to the notice of the Meteorological Council.

In the meantime perhaps you will be good enough to state whether, under the proposed arrangement, the future quarterly payment would be made in due course, without application from this Office.

I have, &c.
(Signed) HENRY TOYNBEE,
for the Secretary.

The Secretary, Treasury.

M.O. 1881.

SIR, Treasury Chambers, August 23, 1877.

IN reply to the inquiry made in your letter of the 20th instant, I am directed by the Lords Commissioners of Her Majesty's Treasury to state that it would be more convenient, and more in accordance with practice, that the Meteorological Office should *apply* for the quarterly grant.

I am, &c.
(Signed) WILLIAM LAW.

Henry Toynbee, Esq., Meteorological Office.

The Secretary was instructed to inform the Treasury that application would be made quarterly for the instalments of the vote.

Reported—That an order for 3,000*l.* had been received August 21, and lodged to account of Council.

The Secretary asked for instructions as to the audit of the accounts, and it was resolved that the accounts be audited regularly by the Council, as heretofore by the Committee, and the Secretary was instructed to inquire of the Audit Office at what intervals (monthly, quarterly, or yearly), it would be most convenient to forward the accounts to that Office.

Read—A letter from Captain Toynbee submitting excellent logs by—

Captain T. M. Almond, barque "Decapolis" (Minutes 1876, p. 93).
„ A. E. Barlow, s.s. "Nizam."
„ A. J. Brown, barque "Maroon" (Minutes 1876, p. 140).
„ W. F. Caborne, ship "Waitara."
„ H. Campbell, ship "Rajmahal" (Minutes 1876, p. 118).
„ W. R. Cato, s.s. "Hibernia" (Minutes 1877, p. 34).
„ W. Ellery, ship "Bowfell" (Minutes 1876, p. 87).
„ G. Gaye, ship "Œnone" (Minutes 1876, p. 118).
„ D. Gray, s.s. "Eclipse" „ „ „
„ J. Gray, s.s. "Hope" „ „ „
„ J. P. Holdich, R.N.R., barque "Bebington" (Minutes 1875, p. 60).
Staff-Commander H. Hosken, H.M.S. "Pearl" (Minutes 1877, p. 35).
Captain G. H. Jones, s.s. "Quang-se" and s.s. "Dwina" (Minutes 1877, p. 11).
„ A. Kerr, ship "Ardgowan" (Minutes 1875, p. 60).
„ H. Longley, s.s. "Yorkshire" (Minutes 1876, p. 107).
„ D. F. McKechnie, barque "Cottica" (Minutes 1875, p. 45).
„ D. Marshall, ship "Lady Octavia" (Minutes 1876, p. 107).
„ A. J. Miller, ship "Camperdown" (Minutes 1875, p. 60).
„ C. C. Prehn, ship "Mikado" (Minutes 1876, p. 107).
„ J. J. Price, barque "Sorata" (Minutes 1877, p. 35).
„ W. Scott, brig "Alliance."
„ W. Symington, s.s. "Hankow" (Minutes, 1876, p. 108).
„ E. W. Turner, barque "Mertola" (Minutes 1877, p. 34).
„ W. Warden, s.s. "Alpha" (Minutes 1876, p. 118).
„ H. G. Wilcox, R.N.R., s.s. "Glenfinlas" (Minutes 1876, p. 48).
„ W. J. L. Wharton, R.N., H.M.S. "Fawn" (Minutes 1877, p. 35).

Mr. Scott was instructed to convey the marked thanks of the Council to the above gentlemen, and to present a copy of Charts (O. 27) to Captains Barlow, Caborne, and Scott.

Submitted—The following Reports:—

GENTLEMEN,

I HAVE to report that I have completed the inspection of the telegraphic stations, with three exceptions (Sumburgh Head, Nottingham, and Roche's Point), and of the observatories in connexion with the Office, as well as of some stations of the Second Order.

Oxford, visited August 2.—At this station I have ventured to request Mr. Main to allow the Office to supply a Stevenson's thermometer screen, with a set of thermometers, and a rain-gauge, inasmuch as the instruments in use at the Observatory leave much to be desired as regards the sufficiency of their exposure, &c. (These changes have been carried out.)

York, visited September 8
Scarboro', „ 8
North Shields, „ 10
} These stations are in good order and call for no remarks.

Leith, visited September 11.—The instruments here are in good order, but it would be desirable, if possible, to obtain a more open site for the thermometers and rain-gauge. This will be a matter of some little difficulty.

Nairn, visited September 12
Stornoway, „ 14
Thurso, „ 19
Wick, „ 19
} At these stations, too, all was found in order.

Aberdeen, September 20.—This station is in very good order, but Mr. McCormack, the reporter, is about to remove to a different house, which will be at a greater distance from the telegraph station than his present one; I have therefore authorized him to erect two thermometers close to the telegraph station, to furnish readings when special reports are called for by the Office in London.

Ardrossan, visited September 22.—The only thing to remark at this station is that I changed the two barometers there, inasmuch as the readings had long been held to be slightly astray, and the instruments had been at the station more than 12 years.

Bidston, visited September 25.—This station can hardly be said to have been inspected, I must however remark that I found the wet-bulb thermometer badly mounted, and that the rain-gauge is not well exposed.

Mr. Hartnup is anxious to be relieved of the duty of reporting, as he is very short of hands.

Holyhead, visited September 26 } These two stations are in fairly good order. They are both
Kingstown „ „ 27 } provided with wall thermometer screens. They are well situated for observations of wind and weather. There is a great difficulty at both these stations in supplying the observer's place if absent on any account.

Valencia, visited October 2.—This station is in a satisfactory condition, the rain-gauge was not strictly circular, and I instructed Mr. Cullum to have this set to rights. There has been much ground for complaint in the working of the telegraphic communication with this station, but the Post Office authorities have promised amendment.

Donaghadee, visited October 9.—This station is working well, the thermometer screens are wall screens, as the observer has no space available for the erection of a Stevenson's screen.

Moville (*Greencastle*), visited October 10.—The observer Mr. Lowry is not yet thoroughly trained, but is willing to learn. He did not quite understand the use of the reduction tables, which I explained to him. His vane, too, was incorrect, being loosely fixed, and had slewed round till it corresponded nearly with compass bearings, although it had been set correctly by me in 1876.

St. Ann's Head, visited October 15.—This station was, as usual, in very good order. The only defect is in the minimum thermometer. A new syren fog-horn has been erected by the Trinity House close to the thermometer screen, and when this is blowing the vibration imparted to the air shakes the index of the thermometer even though the instrument itself be fastened quite tight. I am supplying a thermometer less likely to be shaken. It is not practicable to move the thermometer screen from the wall of the signal tower, especially as the cattle grazing on the Head would probably knock down any free standing screen.

The station of *Sumburgh Head* was not visited, as reports have been seldom received from it by wire during the year, and my time was limited.

Roche's Point, not visited, as it is known to be in good order, and the strike on the railroad made communication precarious.

Nottingham not visited yet.

I have also to report that I visited all the Observatories, except Kew and Falmouth; viz., Aberdeen, September 20; Glasgow, September 21; Stonyhurst, September 24; Valencia, October 2; and Armagh, October 9.

My visit occurred so soon after that of Mr. Whipple that there is nothing to remark.

I have also visited some of the stations of the Second Order:

Leicester, visited September 7.—Mr. Harrison, the curator of the museum, keeps this station very satisfactorily. It is the best town station which we have, and will serve well as a telegraphic station in case of failure of Nottingham.

Seaham, visited September 10.—This station is in fairly good order. Mr. Aird, the observer, is not a scientific man, but he is painstaking and is gradually improving.

Prestwich, near Manchester, visited September 25.—This station is in the grounds of the Lunatic Asylum, and the observer is Dr. R. H. Clunn, the principal medical officer. The situation is extremely open, and the station bids fair to be a valuable one.

Parsonstown, visited October 11.—This station is very satisfactory, except as regards wind observations, the trees in the park evidently affecting the anemometer very seriously.

In conclusion I would only say that I hope the Council will give as favourable a consideration as they can to the claims of the telegraphic observers to increased pay, say to the extent of 2*s*. 6*d*. per week.

ROBERT H. SCOTT,
Secretary.

REPORT on OBSERVATORIES, 1877.

I beg respectively to submit to the Meteorological Council the following report upon the present condition of the instruments at their self-recording observatories, visited on the days named:

Falmouth, August 28 and 29.—The thermograph and barograph are in very good order. I found the clamp screw of the wet-bulb lamp broken in its place, and instructed Mr. Olive, the instrument maker to drill it out and put a new one in. Mr. Squire complained of frequent failures of the springs to cylinder clips, and asked for a spare cylinder to be used as a substitute, when either of the others should want repair. I took dimensions of spindles so that a new one can be sent down.

The anemometer is in good order throughout, with the exception of the fans, which are much corroded, and should be replaced with new ones; one blade I found quite broken away from the centre, and ordered it to be refixed as well as possible to avoid danger.

An observed stiffness of action of the rain-gauge was remedied by the addition of paraffin which had evaporated from the mercury trough.

Valencia, September 3 and 4.—The thermograph, barograph, and rain-gauge are all in good order. Mr. Cullum asked for a duplicate cylinder for a similar reason to that of Mr. Squire as stated above. The thermograph tubes are now tightly tied down to avoid another possible shift of position similar to one observed recently. The anemograph is in good order, but having a spring clock a considerable delay might occur, in the event of the spring at any time breaking, before the instrument could again be started. I would recommend that spare springs be provided in case of accident. One of the fans has worn very loose on the spindle. I re-bushed it with lead and instructed Mr. Cullum to get it properly done if it worked loose again. The staging put round the instrument since last year, appeared to me too high and likely to impede the free action of the vane, and at my suggestion it was lowered to a more suitable position.

The photographic processes appeared somewhat defective at the time, and I advised certain alterations in the mode of working, with a view of lessening the causes of failure.

Holyhead, September 11—The anemograph is in very good order and carefully kept, but from stoppage of the oil holes the velocity countershaft had rusted in both its bearings and stripped them. I cleaned them out, and instructed Mr. Williams to get new linings put in at once. Probably the indications of the instrument have been unreliable during light winds since the above defect has existed.

Armagh, September 12 and 13.—The thermograph, barograph, rain-gauge and anemograph are all in good order. Dr. Robinson having expressed a wish to inspect the bearings of the latter instrument, I took them down, and he with Professor Stokes, carefully examined their construction and condition. He suggested that the wear which has taken place in the foot of the cup spindle would be obviated by making the bearing surface an agate sphere. Probably such a contrivance will be required in the course of time, as all the instruments show similar wear. I would venture to recommend that the alteration should be made at the time of the next annual inspection.

Glasgow, September 14 and 15.—The barograph, thermograph, and rain-gauge are in good order, and new springs have been fitted to cylinder clips.

The anemograph was also in good order both externally and internally, with the exception of the long connecting shafts, which were both found to be split throughout the greater part of their length, the splitting being apparently due to corrosion. Mr. White took the necessary measurements for new shafts, and on my return on September 20th, I found he had fixed stout new ones, which being well painted will probably escape corrosion.

Aberdeen, September 17 and 18.—The thermograph and barograph are both in good order, but the clock dials are much discoloured from atmospheric influence upon the silvered brass of which they are formed. Enamelled ones as at Kew would be improvement.

The rain-gauge is in good order, as is also the anemograph both internally and externally. The foot of the cup shaft of the latter instrument was so much worn, that I requested Professor Thomson to get it turned up afresh.

Stonyhurst, September 22.—The self-recording instruments are all in good order, and working satisfactorily. The Rev. S. J. Perry suggests the substitution of a new and longer barograph slit, for the one at present attached to his instrument, in order to permit of the registration of a lower barometric pressure than he can now obtain.

Kew.—The thermograph and barograph are both in good order, as is also the anemograph. The proper working of the latter instrument is interfered with during light winds by the action of the von Oettingen integrator, which instrument I shall detach as soon as its own cups and vane are received from Dorpat.

The rain-gauge is also working well. I am constructing a new pencil holder, which I hope will improve the quality of the traces.

Kew Observatory, October 1877. G. M. WHIPPLE.

Reported—That since the end of July new instruments had been ordered to keep up stock to the subjoined amount, which includes cost of verification :—

Board of Trade account.		Deep sea thermometers for lightships -	£21	0	0
,,	,,	Maximum and minimum thermometers	11	14	0
Admiralty	,,	Ordinary thermometers - -	35	2	0
			£67	16	0

The Secretary exhibited the following new Weather Charts, &c. :—

Algerian Meteorological Office (for Europe).
Danish, for newspaper issue (North of Europe).
Victorian Government, Weather Bulletin (for Australia).

Reported—That information respecting weather on the northern coast of Cornwall on 10th October 1876 had been supplied to the Registrar-General of Seamen, and that Daily Weather Charts had been supplied to the following :—

Dr. Clunn, Prestwich (near Manchester), observer.
M. Hébert, Draguignan, France.
Press Association, for Plymouth "Daily Mercury."

Submitted—A proposal (Letter 1,969) from Mr. T. Rossiter, schoolmaster, Norfolk Island, to take Meteorological Observations, if supplied with instruments and remunerated to a moderate extent.—Consideration postponed.

Mr. Buchan, the newly appointed inspector and agent for Scotland, was introduced to the Council, and his duties, as defined in the Minutes of October 3rd, were explained to him by the Chairman.

It was agreed that if any fees should be charged by the Kew Observatory for his attendance there they should be defrayed by the Office.

It was resolved that no steps be taken to appoint an inspector for Ireland during the present financial year.

SUBMITTED—The following STATEMENT respecting the RECORDS for May 1877, received from the SELF-RECORDING OBSERVATORIES, which have been examined at the METEOROLOGICAL OFFICE (see Minutes, 21st December 1868).

	Aberdeen.		Armagh.		Falmouth.		Glasgow.		Kew.		Stonyhurst.		Valencia.	
ANEMOGRAPH:—	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.
Action	Fair.	Good.	Good.	Fair.	Good.	Good.	Good.	Indifferent.	Fair.	Good.	Fair.	Good.	Good.	Good.
Records deficient, due to stoppage of clock	0	0	0	0	0	0	0	0	0	0	0	0	0	0
„ „ other causes	0	0	0	0	0	0	4	6	0	0	†6 hrs.	†6 hrs.	0	0
Orientation verified	31st	—	30th	—	15th	—	31st	—	4th&25th	—	26th	—	18th	—
No. of errors discovered by subsidiaries	0	0	0	0	0	1	0	1	0	0	0	0	1	0
„ „ irregular differences	0	0	0	0	0	0	0	0	0	0	2	5	0	4
Result of 40 *Remeasurements*:—														
Greatest difference	1·0	2·0	1·0	2·0	1·0	2·0	1·0	2·0	1·0	1·0	1·0	1·0	0·0	1·0
Mean difference irrespective of sign	0·0	0·5	0·0	0·7	0·0	0·4	0·1	0·8	0·2	0·3	0·0	0·5	0·0	0·5
Residual difference (— Meteorological Office)	0·0	−0·1	0·0	−0·2	0·0	+0·1	0·0	0·0	−0·2	0·0	0·0	0·0	0·0	−0·1
RAIN GAUGE:—														
Action	Good.		Good.		Good.		Fair.		Good.		Good.		Good.	
Records deficient, due to stoppage of clock	0		9 hrs.		0		* 7 days.		0		0		0	
„ „ other causes	0		0		0		0		0		0		0	
Errors in tabulation	0		0		1		1		0		0		1	

BAROGRAPH :—

Action	Good.	Good.	Good.	Good.	Good.	Good.	Good.
Photography	Do.	Do.	Do.	Do.	Do.	Do.	Fair.
Records deficient, due to stoppage of clock	0	1 hr.	0	0	0	0	0
„ „ failure of light	0	0	0	0	‡ 5 hrs.	0	2
„ „ other causes	0	0	0	0	0	0	0
No. of errors discovered—							
In entry of standard	0	2	0	10	1	4	0
„ calculating residual correction	0	1	0	2	0	4	0
„ applying residual correction	0	0	0	1	1	2	3
„ subtraction in subsidiary tables	0	0	0	0	2	2	1
„ tabulation by subsidiaries	0	0	0	0	0	0	0
„ „ irregular differences	0	3	0	0	2	0	0
Result of 40 *Remeasurements :—*							
Greatest difference	0·006	0·006	0·005	0·005	0·005	0·006	0·005
Mean difference irrespective of sign	0·0029	0·0032	·0026	0·0025	0·0021	0·0036	0·0024
Residual difference (—Meteorological Office)	—0·0022	+0·0022	—0·0001	—0·0003	—0·0001	—0·0027	—0·0007
Mean monthly difference between simultaneous Barograph and Barometer readings	0·0013	0·0023	0·0021	0·0018	0·0020	0·0023	0·0012

THERMOGRAPH :—

Action	Good.		Good.		Good.		Good.		Good.		Good.		Good.	
Photography	Do.		Do.		Do.		Do.		Do.		Do.		Fair.	
	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
Records deficient, due to stoppage of clock	0	0	0	0	0	0	0	0	0	0	0	0	0	0
„ „ failure of light	0	0	0	0	0	0	0	0	‡ 10 hrs.	‡ 10 hrs.	0	0	0	0
„ „ imperfectly moistened bulbs	—	0	—	3 hrs.	—	4 hrs.	—	0	—	2 hrs.	—	0	—	3
„ „ partially frozen	—	13 hrs.	—	0	—	0	—	1 hr.	—	2 hrs.	—	2 hrs.	—	0
„ „ other causes	0	0	0	0	0	0	0	0	0	0	§ 2 hrs.	§ 2 hrs.	0	0
No. of errors discovered in entry of Standard	0	1	5	1	0	0	2	2	2	0	0	1	0	0
„ „ by subsidiary measurements	0	0	0	0	0	0	0	0	0	0	0	0	0	0
„ „ of subtraction in do. tables	1	0	0	0	0	0	4	1	3	2	0	2	0	3
„ „ detected under glass scale	0	0	6	8	2	0	1	0	4	3	1	3	0	0
Result of 40 *Remeasurements :—*														
Greatest difference	0·3	0·3	0·3	0·3	0·3	0·2	0·3	0·3	0·4	0·5	0·3	0·5	0·3	0·3
Mean difference irrespective of sign	0·08	0·14	0·09	0·08	0·08	0·09	0·12	0·07	0·15	0·11	0·17	0·15	0·12	0·14
Residual difference (—Meteorological Office)	—0·04	+0·10	+0·04	+0·06	+0·02	0·00	0·00	—0·05	—0·07	0·00	+0·15	+0·05	0·00	+0·01
Mean monthly difference between simultaneous Thermograph and Thermometer readings	0·15	0·19	0·18	0·21	0·09	0·16	0·20	0·20	0·15	0·18	0·12	0·18	0·14	‖0·37
No. of errors in maxima and minima	0	—	2	—	3	—	3	—	6	—	4	—	0	—

* Instrument under repair. † Cleaning instrument. ‡ Gas low. § Binding rod out of order. ‖ Owing to a small shift of Thermograph, thermometer in its frame, which temporarily threw out the value of the zero line.

SUBMITTED—The following STATEMENT respecting the RECORDS for June 1877, received from the SELF-RECORDING OBSERVATORIES, which have been examined at the METEOROLOGICAL OFFICE (see Minutes, 21st December 1868).

—	Aberdeen.		Armagh.		Falmouth.		Glasgow.		Kew.		Stonyhurst.		Valencia.	
ANEMOGRAPH :—														
Action - - - - - -	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Indifferent.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Good.	Direction. Fair.	Velocity. Good.
Records deficient, due to stoppage of clock -	0	0	9 hrs.	9 hrs.	0	0	0	0	0	0	0	0	0	0
„ „ other causes - -	0	0	0	0	*22 hrs.	0	0	0	§ 7 hrs.	§ 10 hrs.	0	0	0	0
Orientation verified - - - - -	30th	—	30th	—	12th	—	30th	—	27th	—	—	—	—	—
No. of errors discovered by subsidiaries -	0	0	0	0	0	0	1	1	0	0	0	5	1	4
„ „ irregular differences -	0	0	0	1	0	1	0	2	1	2	0	2	0	0
Result of 40 *Remeasurements* :—														
Greatest difference - - - - -	1·0	1·0	1·0	1·0	0·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0
Mean difference irrespective of sign - -	0·0	0·5	0·0	0·2	0·0	0·4	0·1	0·4	0·0	0·2	0·0	0·5	0·0	0·5
Residual difference (—Meteorological Office) -	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	0·0	—·1	0·0	—0·1
RAIN GAUGE :—														
Action - - - - - -	Good.		Good.		Fair.		Good.		Good.		Good.		Good.	
Records deficient, due to stoppage of clock -	0		10 hrs.		†24 hrs.		0		0		0		5 hrs.	
„ „ other causes - -	0		0		0		‡5 days.		0		0		0	
Errors in tabulation - - - -	0		0		0		1		0		3		1	

BAROGRAPH :—

Action	Good.	Good.	Good.	Good.	Good.	Good.	Good.
Photography	Do.	Do.	Do.	Do.	Fair.	Do.	Bad.
Records deficient, due to stoppage of clock	0	0	0	0	0	0	0
„ „ failure of light	0	0	0	0	0	0	0
„ „ other causes	0	0	0	‖ 1 hr.	0	0	‖ 5 hrs.
No. of errors discovered—							
In entry of standard	0	4	1	3	5	3	0
„ calculating residual correction	0	2	0	3	2	2	0
„ applying residual correction	0	0	3	2	1	1	0
„ subtraction in subsidiary tables	0	0	0	0	0	0	1
„ tabulation by subsidiaries	0	0	0	0	0	0	0
„ „ irregular differences	0	0	0	4	0	0	0
Result of 40 *Remeasurements :—*							
Greatest difference	0·006	0·005	0·006	0·005	0·006	0·008	0·005
Mean difference irrespective of sign	0·0027	0·0031	0·0031	0·0020	0·0026	0·0024	0·0028
Residual difference (—Meteorological Office)	+0·0004	+0·0000	−0·0025	−0·0012	+0·0016	−0·0016	−0·0020
Mean monthly difference between simultaneous barograph and barometer readings	0·0015	0·0025	0·0018	0·0020	0·0013	0·0021	0·0012

THERMOGRAPH :—

Action	Good.		Good.		Good.		Good.		Good.		Good.		Good.	
Photography	Do.		Do.		Do.		Do.		Fair.		Do.		Bad.	
	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
Records deficient, due to stoppage of clock	0	0	0	0	0	0	0	0	0	0	0	0	0	0
„ „ failure of light	0	0	0	0	0	0	0	0	0	0	0	0	0	2
„ „ imperfectly moistened bulbs	—	0	—	7	—	3	—	3	—	0	—	0	—	0
„ „ partially frozen bulbs	—	0	—	0	—	0	—	0	—	0	—	0	—	0
„ „ other causes	0	0	0	0	0	0	0	0	0	0	1 hr.	1 hr.	0	0
No. of errors discovered in entry of standard	0	0	2	1	0	1	3	0	2	4	1	1	0	0
„ „ by subsidiary measurements	0	0	0	0	0	0	0	1	0	0	0	0	0	0
„ „ of subtraction in do. tables	0	1	16	15	0	0	4	2	3	7	0	1	0	4
„ „ detected under glass scale	1	2	0	0	0	0	1	3	7	4	5	1	0	0
Result of 40 *Remeasurements :—*														
Greatest difference	0·3	0·3	0·3	0·2	0·2	0·3	0·2	0·3	0·3	0·3	0·3	0·3	0·2	0·2
Mean difference irrespective of sign	0·16	0·14	0·08	0·11	0·06	0·11	0·08	0·09	0·11	0·09	0·11	0·15	0·06	0·07
Residual difference (—Meteorological Office)	−0·16	−0·10	−0·06	−0·10	+0·01	−0·08	−0·06	−0·07	−0·08	+0·02	−0·06	−0·06	−0·03	0·00
Mean monthly difference between simultaneous thermograph and thermometer readings	0·19	0·21	0·18	0·21	0·07	0·16	0·18	0·17	0·14	0·23	0·12	0·20	0·13	0·27
No. of errors in maxima and minima	1	–	0	–	0	–	3	–	4	–	4	–	0	–

* Fans taken down for repairs. † Pipe of gauge choked. ‡ Delivery tube bent; instrument under repair. § Instrument stopped to allow von Oettingen's integrator to be attached. ‖ Owing to photographic imperfections.

SUBMITTED—The following STATEMENT respecting the RECORDS for July 1877, received from the SELF-RECORDING OBSERVATORIES, which have been examined at the METEOROLOGICAL OFFICE (see Minutes, 21st December 1868).

—	Aberdeen.		Armagh.		Falmouth.		Glasgow.		Kew.		Stonyhurst.		Valencia.	
ANEMOGRAPH:—	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Fair.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Indifferent	Direction. Good.	Velocity. Good.	Direction. Fair.	Velocity. Good.	Direction. Good.	Velocity. Good.
Action	0	0	0	0	0	0	20 hrs.	20 hrs.	0	0	0	0	0	0
Records deficient, due to stoppage of clock	0	0	0	0	0	0	0	0	0	0	0	0	*2 hrs.	*2 hrs.
„ „ other causes	—	—	31st	—	12th	—	—	—	—	—	24th	—	4th	—
Orientation verified	0	1	0	0	1	0	1	1	0	0	0	5	0	0
No. of errors discovered by subsidiaries	0	0	0	0	0	0	0	0	0	0	2	0	0	0
„ „ irregular differences														
Result of 40 *Remeasurements*:—														
Greatest difference	1·0	1·0	1·0	2·0	1·0	2·0	1·0	2·0	0·0	1·0	1·0	2·0	1·0	2·0
Mean difference irrespective of sign	0.1	0·3	0·2	0·6	0·1	0·7	0.2	0·8	0·0	0·3	0·1	0·6	0·1	0·9
Residual difference (—Meteorological Office)	0·0	+0·2	−0·1	0·0	−0·1	−0·1	0·0	+0·2	0·0	0·0	−0·1	0·0	−0·1	−0·1

RAIN GAUGE:—														
Action	Good.		Good.		Fair.		Good.		Good.		Good.		Good.	
Records deficient, due to stoppage of clock	0		22 hrs.		0		0		0		0		5 hrs.	
„ „ other causes	0		0		0		0		0		0		0	
Errors in tabulation	0		0		0		7		2		3		2	

BAROGRAPH :—							
Action	Good.	Good.	Good.	Good.	Good.	Good.	Good.
Photography	Do.	Do.	Do.	Do.	Bad.	Do.	Bad.
Records deficient, due to stoppage of clock	0	0	0	0	0	0	0
„ „ failure of light	11 hrs.	0	0	0	0	†7 hrs.	0
„ „ other causes	0	0	0	0	0	0	0
No. of errors discovered—							
In entry of standard	0	7	1	0	1	3	0
„ calculating residual correction	0	5	0	2	0	0	0
„ applying residual correction	0	0	0	2	1	3	0
„ subtraction in subsidiary tables	0	1	0	0	0	0	2
„ tabulation by subsidiaries	0	0	0	0	0	0	0
„ „ irregular differences	0	0	0	0	3	0	0
Result of 40 *Remeasurements :—*							
Greatest difference	0·006	0·006	0·005	0·005	0·005	0·0005	0·0005
Mean difference irrespective of sign	0·0029	0·0031	0·0028	0·0027	0·0021	0·0026	0·0023
Residual difference (— Meteorological Office)	−0·0021	−0·0014	−0·0005	+0·0010	−0·0012	−0·0009	−0·0002
Mean monthly difference between simultaneous barograph and barometer readings	0·0015	0·0027	0·0017	0·0018	0·0028	0·0017	0·0012

THERMOGRAPH :—														
Action	Good.		Good.		Good.		Good.		Good.		Good.		Good.	
Photography	Do.		Do.		Do.		Do.		Bad.		Do.		Bad.	
	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
Records deficient, due to stoppage of clock	0	0	0	0	0	0	0	0	0	0	0	0	7 hrs.	7 hrs.
„ „ failure of light	‡15 hrs.	‡11 hrs.	0	0	0	0	0	0	4 hrs.	0	†7 hrs.	†7 hrs.	0	0
„ „ imperfectly moistened bulbs	—	1	—	0	—	5	—	0	—	0	—	0	—	0
„ „ partially frozen	—	0	—	0	—	0	—	0	—	0	—	0	—	0
„ „ other causes	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of errors discovered in entry of standard	0	0	0	0	0	0	1	0	0	0	0	7	0	0
„ „ by subsidiary measurements	0	0	0	0	0	0	0	0	0	0	0	0	0	0
„ „ by subtraction in do. tables	1	0	0	0	0	0	1	4	3	1	1	0	3	0
„ „ detected under glass scale	0	0	3	6	4	0	3	3	0	0	0	0	5	1
Result of 40 *Remeasurements :*														
Greatest difference	0·3	0·2	0·3	0·3	0·2	0·3	0·3	0·3	0·3	0·3	0·3	0·3	0·3	0·3
Mean difference irrespective of sign	0·14	0·08	0·15	0·15	0·06	0·12	0·09	0·09	0·12	0·11	0·11	0·12	0·10	0·10
Residual difference (— Meteorological Office)	−0·10	−0·06	−0·12	−0·11	0·00	−0·09	−0·05	−0·09	−0·05	−0·05	−0·10	−0·08	−0·05	−0·06
Mean monthly difference between simultaneous thermograph and thermometer readings	0·17	0·17	0·13	0·17	0·11	0·23	0·18	0·14	0·11	0·23	0·13	0·17	0·16	0·20
No. of errors in maxima and minima	0	–	4	–	1	–	8	–	1	–	0	–	6	-

* Pencils not lowered.

† Owing to an accident to main pipe.

‡ Gas cut.

The consideration of Suggestion No. II. (Minutes, October 3,) relating to Ocean Meteorology, was then resumed, and the question of the proposed mode of dealing with the logs in the Office was discussed.

The Hydrographer submitted a specimen of a graphical representation of the Observations, and was requested to follow up his proposal with especial reference to the possibility of taking the observations directly from the logs without first extracting them into Data Books.

The Hydrographer was also requested to draw up a memorandum embracing the principal points to be attended to in dealing with the materials for Ocean Meteorology in the Office, and the Secretary was instructed to append to this memorandum such statistics and estimates bearing upon it as he can furnish.

Submitted—The following abstract of accounts from April 1st, 1877, to September 30th, 1877 :

Income.	£	s.	d.
Balance from year 1876–7	67	7	8
Vote for year 1877–8	12,000	0	0
Weather information supplied for newspapers, &c.	191	0	9
Repayments for telegrams, subscriptions for D.W. Charts, &c.	436	4	8
Supply of data from ships' logs, &c.	7	18	0
Sale of Instruments, &c.			
Mercantile marine account	26	11	6
Royal Navy „	8	4	0
Observatory „	7	10	0
Repayments of expenses charged under :			
(1) Incidental expenses	12	13	10
(2) Observatories, &c.	6	16	10
Interest on deposit account	1	17	1
Commision charged for work done for Colonies, &c.	37	18	10
Sundries	12	8	2
Total	£12,816	11	4

Expenditure.	£	s.	d.
Office :			
Council	250	0	0
Salaries and wages	705	17	3
Rent, fuel, and lighting	280	16	6
Incidental expenses	173	13	5
Land Meteorology :			
Observatories and other stations	1,172	16	5
Computations (reduction of observations)	595	5	9
Weather telegraphy	1,365	14	1
Computations	657	15	3
Ocean Meteorology :			
Royal Navy :			
Supply of instruments	130	19	5
Other expenses	73	12	4
Mercantile Marine :			
Supply of instruments	240	4	6
Other expenses	109	11	11
Computations (reduction of observations) and care of instruments	790	4	3
	6,546	11	1
Balance	6,270	0	3
Total	£12,816	11	4

Liabilities.	£	s.	d.
To sundry creditors (partly estimated)	1,072	17	7
„ council	250	0	0
„ balance of revenue account, (as above)	6,270	0	3
Total	£7,592	17	10

Assets.	£	s.	d.
By cash in hand and on current account	1,202	19	0
„ balance in hand at Valencia	50	0	0
„ H.M. Exchequer	5,950	0	0
„ sundry debtors	389	18	10
	£7,592	17	10

The value of stock of instruments, &c. is not included in this statement.

The following cheques for July were drawn on the 26th of that month :—

For Office :				£	s.	d.
R. H. Scott	Salaries and wages			66	13	4
J. S. Harding, jun.				20	16	8
J. S. Harding, sen.				*7	14	0
T. D. Bell				8	6	8
E. Higgs, repairs, &c.				10	18	0
Pickford & Co., railway charges		0	19 5			
„ „ „		0	11 0			
				1	10	5
Carried forward				£115	19	1

* Four weeks to the 28th.

			£	s.	d.
	Brought forward		115	19	1
For Observatories, &c.:					
Hopkin and Williams, chemicals			4	1	9
G. M. Whipple, waxed paper	9 10 0				
„ on account, for inspections	30 0 0				
			39	10	0
J. E. Cullum, Valencia			14	3	4
R. H. Curtis			14	3	4
C. H. Thompson	Computations		*6	8	0
E. G. Aldridge			*5	0	0
J. A. Curtis			10	16	8
For Telegraphy:					
Postmaster-General, telegrams for May			178	2	9
S. M. Clare, Jersey telegrams			50	8	10
F. Dangerfield, delivery of D.W. Chart			12	16	7
F. Gaster			15	16	8
W. L. Dallas	Computations		10	0	0
F. Brodie			8	16	8
H. Chivers			*3	18	0
For Ocean Meteorology:					
P. Adie, repairing "A." barometers	6 7 6				
„ B.T. „	81 17 6				
			88	5	0
G. M. Whipple, verifications			16	14	6
D. McGregor & Co., Glasgow agents			3	18	9
H. Toynbee			33	6	8
R. Strachan			†20	16	8
C. Harding	Computations, &c.		15	0	0
T. E. Allen			10	16	8
H. Harries			7	14	0
On Account:					
J. S. Harding, petty cash			200	0	0
„ „			50	0	0
			£936	13	11

The following cheques for August were drawn on the 4th September:—

For Office:					
R. H. Scott			66	13	4
J. S. Harding, jun.	Salaries and wages		20	16	8
J. S. Harding, sen.			‡9	12	6
T. D. Bell			8	6	8
Pall Mall Coal Co., coals			9	4	0
Pickford & Co., railway charges			1	9	6
For Observatories:					
J. E. Cullum, Valencia			14	3	4
R.& J. Beck, repairing Yarmouth anemometer			6	15	6
Thos. De La Rue & Co., R.G. paper			9	9	0
R. H. Curtis			14	3	4
E. G. Aldridge			‡6	5	0
C. H. Thompson	Computations		‡8	0	0
C. Stodart			§6	6	0
J. A. Curtis			10	16	8
Carried forward			£192	1	6

* Four weeks to the 28th.
† Including allowance for care of instruments.
‡ Five weeks to the 1st September.
§ Three weeks to the 25th August.

	£	s.	d
Brought forward - - -	192	1	6
For Telegraphy:			
Postmaster-General, June - - - - -	133	6	4
J. McDonald, Florence Court - - - - -	0	18	6
F. Gaster -	15	16	8
W. L. Dallas - } Commutations - - - -	10	0	0
F. Brodie -	8	16	8
H. W. Chivers -	*4	17	6
For Ocean Meteorology:			
J. H. Woodstock, packing cases - - - - -	3	5	6
H. Toynbee -	33	6	8
R. Strachan -	†20	16	8
C. Harding - } Computations, &c. - - - -	15	0	0
T. E. Allen -	10	16	8
H. Harries -	*9	12	6
Miscellaneous:			
P. Adie, on account, MM. Van der Stok and Ellery - -	18	17	8
Hopkin and Williams, on account, Aberdeen Observatory -	3	15	10
W. Munro, on account, MM. Wild and Kingston - -	89	18	0
J. S. Harding, jun., on account of Office expenses - -	160	0	0
,, ,, - - - - -	60	0	0
R. H. Scott, on account of Inspections - - - -	60	0	0
Total - - -	£851	6	8

The following cheques for September were drawn on the 29th of that month:—

	£	s.	d
For Office:			
R. H. Scott -	66	13	4
J. S. Harding, jun. } Salaries and wages - -	20	16	8
J. S. Harding, sen.	‡7	14	0
T. D. Bell -	8	6	8
C. W. Jacques, rent - - - - - -	133	13	0
E. Higgs, cleaning and repairs - - - - -	31	13	0
Pickford & Co., carriage - - - - - -	1	12	2
Williams and Norgate, books - - - - -	3	6	5
For Observatories; Quarterly allowances, &c.:			
D. Thomson, Aberdeen - - - - - -	§58	1	8
T. R. Robinson, Armagh - - - 40 14 0			
,, (Expenses) - - - 9 16 3			
	50	10	3
W. L. Fox, Falmouth - - - - - -	§65	12	6
R. Grant, Glasgow - - - - - -	§61	17	6
H. Williams, Holyhead - - - - - -	2	13	5
G. M. Whipple, Kew - - - - - -	100	0	0
,, Balance for Inspections - 39 5 0 / 30 0 0	9	5	0
C. Clouston, Orkney - - - - - -	2	10	0
G. H. Aird, Seaham - - - - - -	2	13	10
S. J. Perry, Stonyhurst - - - §49 0 0			
,, (Postage) - - - 1 0 2			
	50	0	2
J. E. Cullum, Valencia - - - 45 1 11			
,, (Salary) - - - 14 3 4			
	59	5	3
Carried forward - - -	£736	4	10

* Five weeks to the 1st September.
† Including allowance for care of instruments.
‡ Four weeks to the 29th September.
§ Deduction made for stores supplied.

	£	s.	d.
Brought forward - - -	736	4	10
G. T. Watson, Yarmouth - - - - -	4	15	6
R. H. Curtis - }	14	3	4
C. H. Thompson } Computations - - - -	*6	8	0
E. G. Aldridge - }	*5	0	0
J. A. Curtis - }	10	16	8
For Telegraphy; Quarterly Allowances, &c.			
Postmaster-General, July - - - 127 11 11			
„ „ Valencia wire - - 23 10 0			
	151	1	11
W. McNeil, Ardrossan - - - - 0 13 11			
„ for Postmaster - - - 0 6 6			
	1	0	5
H. Todd, Cambridge - - - - - -	4	12	0
J. Costello, Dover - - - - - -	3	6	0
J. Tilston, Holyhead - - - - - -	3	19	6
J. Fisher, Jersey - - - - - -	4	6	6
G. Mitchell, Kingstown - - - - - -	3	8	6
F. Gaster, London - - - - - -	3	5	0
J. Lowry, Moville - - - - - -	3	19	3
R. Bellew, „ - - - - - -	1	6	0
W. D. Penny, Nairn - - - - - -	4	4	6
E. J. Lowe, Notts - - - - - -	3	18	0
J. Lucas, Oxford - - - - 3 9 0			
„ for fixing thermometer screen, &c. - 1 10 5			
	4	19	5
J. Merrifield, Plymouth - - - - - -	3	5	0
W. Sandford, Portishead - - - - - -	3	19	0
J. C. Walker, St. Ann's Head - - - - - -	2	8	0
W. Thomas, Scilly - - - - - -	4	7	10
J. Smith, Stornoway - - - - - -	3	18	0
W. Brand, Shetland - - - - - -	3	5	2
J. Trotter, Thurso - - - - - -	3	6	8
J. Sinclair, Wick - - - - - -	3	5	0
G. T. Watson, Yarmouth - - - - - -	4	9	11
C. Wakefield, York - - - - - -	3	6	2
F. Gaster - }	15	16	8
W. L. Dallas - } Computations - - - -	10	0	0
F. Brodie - }	8	16	8
H. W. Chivers - }	*3	18	0
For Ocean Meteorology:			
J. R. Jones, Aberdeen agent - - - - - -	8	5	6
P. A. Feathers, Dundee „ - - - - - -	3	15	0
Z. Scaping, Hull „ - - - - - -	2	5	7
J. Gill, Liverpool „ - - - - - -	16	18	4
Street Brothers, advertisements - - - - - -	1	2	6
H. Toynbee - }	33	6	8
R. Strachan - }	†20	16	8
C. Harding - } Computations, &c. - - - -	15	0	0
T. E. Allen - }	10	16	8
H. Harries - }	*7	14	0
Miscellaneous:			
V. Brooks, Day, & Son, on account G. T. Kingston - -	5	15	0
J. S. Harding, jun., Office expenses - - - -	150	0	0
„ „ - - - - - -	50	0	0
Total - -	£1,370	13	4

* Four weeks to the 29th September. † Including allowance for care of instruments.

The Council then adjourned.

116, *Victoria Street, October* 31, 1877.

PRESENT:

PROFESSOR H. J. S. SMITH IN THE CHAIR.

MR. DE LA RUE. | THE HYDROGRAPHER.
MR. GALTON. | PROFESSOR STOKES.
LIEUT.-GENERAL STRACHEY.

The Secretary was in attendance.

The Minutes of last meeting (October 17) were read and confirmed.

Submitted—The following correspondence:—

P.C. 1941.

SIR, October 19, 1877.

WITH reference to the accounts of this Office, I am directed by the Meteorological Council to request that you will be good enough to inform me whether you would wish to receive the accounts annually in future, as they were presented by the late Meteorological Committee of the Royal Society, or whether it would be convenient to receive them at shorter intervals, say quarterly, in accordance with Nos. II. and XV. of the printed "Rules to be observed in rendering accounts to the Exchequer and Audit Department"?

I am, &c.
(Signed) ROBERT H. SCOTT,
Secretary.

The Comptroller and Auditor General
Somerset House, W.C.

M.O. 2226.
No. 1423.

SIR, Exchequer and Audit Department, October 24, 1877.

I AM directed by the Comptroller and Auditor General to acknowledge the receipt of your letter of the 19th inst., and to inform you in reply, that it will be most convenient for the purpose of examination, that the accounts referred to should be rendered quarterly to this department.

I have, &c.
(Signed) C. A. DE VALMER.

R. H. Scott, Esq.,
Secretary, Meteorological Office.

P.C. 1950.

SIR, October 19 1877.

IN reply to your letter of the 18th August last [see Minutes, Oct. 17] I am directed by the Meteorological Council to inform you that there is no objection on their part to receiving the Parliamentary grant for Meteorology in quarterly instalments as proposed by you.

I am also directed to request that you will instruct H.M. Paymaster General to issue the sum of three thousand pounds (3,000*l.*) to my order, for the expenses of the Office during the current quarter.

I am, &c.
(Signed) ROBERT H. SCOTT,
Secretary.

The Secretary, Treasury.

Reported—That in reply to the above letter an order for 3,000*l.* had been received on the 25th inst. and lodged to the credit of the Council.

The Chairman reported that in accordance with the instructions of the Council on the 3rd inst., he had proceeded to Greenwich, and had been afforded by the Astronomer Royal every facility for inspecting the Observatory. Sir G. Airy had expressed to him his readiness to lend any of the automatic records at Greenwich for examination at the Office and comparison with the records of Kew, or of any other of the Council's observatories.

The Secretary was instructed to ask the Astronomer Royal for specimen curves in order to see whether or not the Greenwich curves could be reduced by the existing pantagraphs to the same scales of time and height as those used in the Office.

The Secretary reported that there would necessarily be some delay in the preparation of specimen Kew electrograms for a year (Suggestion No. IX., Minutes, October 3), inasmuch as the scale of the Kew electrograph had not yet been determined. He was instructed to refer the matter to the Kew Committee.

Reported—That Dr. Gustav Hellmann had called at the Office with a letter from the Minister of Public Instruction, Berlin, requesting that facilities might be afforded to him for inspection of the Office, and that such facilities had been duly afforded.—Approved.

The Secretary reported that, with the approval of the Chairman, a book had been provided to show the hour of arrival of the Staff at the Office, and would be commenced on the first proximo.

He stated that he was anxious to rearrange the hours of attendance, so as to do away with overtime work as far as feasible. Mr. De La Rue was requested to confer with him on the subject.

The Secretary submitted certain letters praying for increased allowances to the observatories, viz.,—

Letters 2313, 1873, from Falmouth.
„ 2677, 1876, „ Stonyhurst.
„ 400, 1877, „ Armagh.
„ 2233, 1877, „ Valencia.

He also brought forward the suggestion in his own report of inspection (Minutes, October 17) respecting increased allowances to telegraphic reporters.

He further stated that Mr. H S. Eaton, President of the Meteorological Society, had requested him to ascertain the wishes of the Council as to a reconsideration of the existing arrangements between the Society and the Office.

The foregoing three subjects were all referred to the Committee on Land Meteorology, which was appointed to meet on Wednesday, November 14, at 2.30 p.m.

Resolved—That the name of Mr. De La Rue be added to the Committee on Land Meteorology.

Mr. Buchan attended the Council, and it was resolved that he should be supplied with such instruments as he required for his inspections.

A suggestion made by Mr. Buchan with respect to the payment of the observers at the Telegraphic Stations was referred to the Committee on Land Meteorology.

A suggestion was also made by Mr. Buchan that the payment of 10*l.* for the care of an anemometer was not sufficient.

The Hydrographer submitted the following Memorandum.

In continuation of the preliminary discussions which have taken place on the subject of Ocean Meteorology, the Hydrographer submits the following points for the consideration of the Meteorological Council:—

1. The number of documents in the Meteorological Office bearing on Meteorology may now be taken at 4,000, and increasing annually at the rate of about 200.

Of these 4,000 documents some 2,270 are ships' weather logs, the remainder relating to land stations; and of the documents received annually more than 90 are ships' logs.

[In these and subsequent statistics absolute correctness has not been attempted; the officers can make the necessary corrections from their books where it may be considered necessary.]

2. Between the 60th parallels of North and South latitude there are some 338 ocean Squares of 10 degrees, and the *daily* observations taken at sea and recorded in the above documents, are, as shown by 12 (monthly) skeleton charts,* very unequally distributed over about 270 of these 338 Squares, the Pacific Ocean, with its 145 Squares, standing prominently out in its deficiencies.

3. To the present time 43 of the 270 Squares have been attacked in more or less detail, by their appropriate logs having been sifted into monthly data books. Thus, of these 43 sifted Squares:

9 have been exhaustively discussed; †
6 are in course of being sifted preparatory to discussion, and it is understood that by August 1878,—the whole of the branch staff being employed on the service,—these Squares will be completed; ‡
13 are sifted into monthly data books, but not discussed; §
15 squares in the Indian Ocean North of the Equator have been sifted for the month of January alone for the Indian Government.

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* *See* Report for 1876–7; also two other Charts giving the distribution of "Materials" marked plates 1 and 2.

† [40, 39, 38, 4, 3, 2, 303, 302, 301].

‡ [442, 441, 440, 478, 477, 476].

§ [45, 44, 43, 42, 41, 6, 5, 304, 300, 335, 334, 1, 36].

4. On examination of the 12 skeleton charts it is clear that the 9 Squares exhaustively discussed (centering round Square 3) have combined among them a far larger number of observations than any same number of Squares in other parts of the world. So far this is a valuable, though at the same time a very laborious, piece of work.

Adding to these 9 Squares the 13 adjacent Squares wholly sifted, and the 21 partially sifted into data books [6 off the Cape of Good Hope and 15 in Indian Ocean], there remain some 230 Squares for which there are records; for a number of these it is true the records are only partial. The observations made among these 230 Squares have yet to be dealt with, though some fragmentary discussions have been made from them.* ¶

5. The question of dealing with this large mass of material, the collection of 20 years, and now lying undigested on the Office shelves, presents itself in various forms. The following appear to me as the most urgent:—

(*a.*) Pursuing the system of the last 10 years, and without reference to whether it was the best that could be desired, either as to the expenditure of time or labour, or money, or the practical or scientific outcome,—what will be the accumulation of undigested material 10 years hence?

(*b.*) Recognising the fact that we have now more in hand, and coming in annually, than can be dealt with, should we go in the direction of strengthening the Office staff (branch) on the one hand, and curtailing the observers on the other.

(*c.*) Or, allowing the Office staff (branch) and collectors to remain at their present numbers; should we expand our collections in regions where the wants are assured, and close or materially curtail the collections in those regions where we have more than can at present be grappled with.

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* *See* Official Publications, Nos. 4, 11, 12, 13, 18.

¶ MEMORANDUM FURNISHED BY THE OFFICE.

The actual proportion of which the amount of material already attacked bears, to that untouched (over the whole ocean between 80° N. and 80° S., *i.e.*, over 470 residue unattacked,) is in round numbers shown by the following rough estimate:—

DISTRIBUTION of OCEAN METEOROLOGICAL OBSERVATIONS, considering only the first 4,000 Documents (out of which 2,270 are Logs available for the discussion of Ocean Meteorology) in the Meteorological Office.

Data obtained from Charts published in Report of Meteorological Committee, 31st May 1877.

The total number of DAYS' observations over the whole globe = 444,660.

	Days' Observations.	% on whole Globe.	
The No. of DAYS' Observations in *nine* 10° *Squares* of Atlantic Equatorial District (discussion already published[a])	=49,390	11	Atlantic Equatorial and Cape of Good Hope districts combined:—
The No. of DAYS' Observations in remaining *thirteen* 10° *Squares* of Atlantic Equatorial District (extracted into data books,[a] but not published)	= 8,750	2	Days Observations. 81,590 — % on whole Globe. 18
The No. of DAYS' Observations in *six* 10° *Squares* in the neighbourhood of the Cape of Good Hope (now under discussion)	=23,450	5	
The No. of DAYS' Observations in *fifteen* 10° *Squares* in North Indian Ocean (contemplated to be discussed[b] by the Indian Government)	=30,260	7	
The No. of DAYS' Observations in *eight* 10° *Squares* in North Atlantic Ocean (contemplated to be discussed by the German Government)	=39,040	9	
The total *residue* No. of DAYS' Observations over the globe, in say *four hundred and seventy* 10° *Squares*, excluding all districts mentioned above	=293,770	66	

[a] The whole of the observations in the first 4,000 documents were not used in the discussion of the Atlantic Doldrum District. The extraction for the discussion of that district ended at Document No. 2,843.

	Sets of Observations, *i.e.*, Lines of Data Books.	Days' Observations, approximately.	
There were in this discussion:—			Whole of Atlantic Equatorial District:—
Actually extracted into Data Books for *nine* 10° *Squares* in Atlantic Equatorial District	=113,000	28,250	Sets of Observations, *i.e.*, Lines of Data Books. 124,600 — Days Observations approximately. 31,150
Actually extracted into Data Books for remaining *thirteen* 10° *Squares* in Atlantic Equatorial District	11,600	2,900	

[b] The observations for January (3,394 DAYS' observations =0·8% of DAYS' observations for whole globe) are already extracted into Data Books.

6. Whatever may be the line of action adopted, it can only be considered as tentative, until we have before us in some intelligible shape the undigested material now in Office. It may be advanced on this head, that the 12 charts of the distribution of existing material published in the report of 1876–7 meet this want. It is true, as stated in the Report, that "they give a more correct idea of "the amount of material really available for the discussion of Ocean Meteorology than anything "which has yet been published;" but this is not the real point; wanting fuel for our daily use we care little about what is known of the distribution of coal seams in the country, compared with the more pressing need of what coal there is above ground, and ready to be brought to our doors. The charts, nevertheless, are of real value, so far as they go, for Office work.

7. The quickest, the most effective at sight, and the most economical method of bringing this digest about, is deserving earnest consideration. The placing the observations on properly prepared charts rather than in "Data books" is, I venture to think, the better course to adopt. It will be unquestionably a task of some magnitude, but not formidable, if the details be carefully worked out beforehand.

8. Unless some such measure of digesting the accumulated material be undertaken, contributions of a general value to the science of Meteorology are at a standstill.

Although faultless accuracy be not attainable by the means at our disposal, I do not see, for example, why valuable additions should not be made—possibly amounting to a recasting—to Dove's isothermal lines; Buchan's barometric curves, and especially to the Admiralty Wind, Weather, and Current charts. We are told by Mr. Brassey, M.P., in the fifth (July) number of the "Nineteenth Century" something very practical on this head.

9. Whenever the Council are in a position to arrive at some fairly definite conclusion on the more prominent of the foregoing points brought under their review, I hope to be prepared to enter into special questions of detail. One of these would be the utilization of a large collection of observations existing in the Remark Books of Her Majesty's ships specially prepared for the Admiralty Hydrographic Department.

Could we, for example, see on graphically prepared charts, such as I have sketched out, the vacant places, or areas outside the tracks of merchant ships, direct search could at once be made among these records; and, what is still more to the point, instead of pursuing an aimless kind of collection there would be no difficulty in securing the effective co-operation of the officers of Her Majesty's ships when these wants were presented to them in a definite form.

FREDK. JNO. EVANS,
Admiralty, October 22, 1877. Hydrographer.

The Hydrographer also submitted specimen charts of Ten-degree Square No. II., for the months of February and August (partly), containing entries of all the observations in the data book for that Square.

Resolved—That a tentative experiment be made on the lines suggested by the Hydrographer, with reference to one of the "Cape" Squares now under discussion in the Office.

Read—A letter from Captain Toynbee submitting an "excellent" log kept by Lieut. G. N. A. Pollard, R.N., on board H.M.S. "Nassau," Captain R. H. Napier, in the China Seas, Feb. 1–May 1, 1877 (Minutes, 1877, p. 35).

Resolved—That the marked thanks of the Council be given to Captain Napier and Mr. Pollard.

Reported—That Captain McKechnie, barque "Cottica," (Minutes, 1875, p. 45,) had applied to the Office for leave to buy a standard compass, and that the instrument had been presented to him, inasmuch as he had kept seven "excellent" logs.—Approved.

Submitted—An application (Letter 2239) for a Fishery Barometer for Carradale, Kintyre, Argyllshire.—Granted.

Reported—That the Daily Weather Reports had been supplied to Briton Ferry for exhibition.

Read—Letter 2259 from Rev. James Pearson applying for the loan of a file of the Reports for 1877, for the purposes of his Tidal Investigations.

The application was supported by the Hydrographer and by Professor Stokes, and was granted.

Read—Letter No. 2209 from Professor Tyndall, enclosing a description of an automatic Meteorological Barometrograph by Henry Guy Carleton, of New Orleans.

The following cheques for October were drawn to-day:—

	£	s.	d.	£	s.	d.
For Office:						
R. H. Scott, J. S. Harding, junior, J. S. Harding, senior, T. D. Bell — Salaries and wages				66	13	4
				20	16	8
				* 7	14	0
				8	6	8
H. Bond, Office repairs				8	4	6
Pickford & Co., Carriage				2	5	11
For Observatories:						
G. M. Whipple, Kew				12	10	3
J. E. Cullum, Valencia				14	3	4
W. Marriott, Meteorological Society's Returns				34	10	0
R. H. Curtis, C. H. Thompson, E. G. Aldridge, J. A. Curtis — Computations				14	3	4
				*6	8	0
				*5	0	0
				10	16	8
For Telegraphy:						
The Postmaster General, August				196	10	4
F. Dangerfield, delivery of D. W. Charts				12	17	5
J. J. Hicks, Thermometer Screens				3	5	9
F. Gaster, W. L. Dallas, F. Brodie, H. W. Chivers — Computations				15	16	8
				10	0	0
				8	16	8
				*3	18	0
For Ocean Meteorology:						
P. Adie, repairing "A" instruments	17	4	6			
" "B T" instruments, and repairs	14	4	6			
				31	9	0
J. J. Hicks, repairing "A" instruments				0	12	9
F. Pastorelli " "				3	7	0
G. M. Whipple "A" verifications	15	12	0			
" "B T" "	13	13	6			
				29	5	6
D. McGregor & Co., Glasgow agents				7	14	5
H. Toynbee, R. Strachan, C. Harding, T. E. Allen, H. Harries — Computations				33	6	8
				20	16	8
				15	0	0
				10	16	8
				*7	14	0
Miscellaneous:						
P. Adie, Commissions				15	19	0
G. M. Whipple "				25	19	0
J. S. Harding, junior, on account, current expenses				150	0	0
" " "				50	0	0
				£864	18	2

* Four weeks to the 27th instant.

The Council then adjourned till Thursday, November 15, at 3 p.m.

116, *Victoria Street, November* 15, 1877.

PRESENT:

PROFESSOR H. J. S. SMITH IN THE CHAIR.

MR. DE LA RUE.	THE HYDROGRAPHER.
MR. GALTON.	PROFESSOR STOKES.

The Secretary was in attendance.

The Minutes of last meeting (October 31) were read and confirmed.

Submitted—The following Minute of Proceedings of the Committee on Land Meteorology :—

November 14, 1877

PRESENT:

PROFESSOR H. J. S. SMITH, CHAIRMAN.

MR. DE LA RUE | MR. GALTON.

PROFESSOR STOKES.

The Secretary was in attendance.

I. The question of increased allowances to the Telegraphic Reporters was discussed, and it was resolved that the Council be recommended to postpone it till the next financial year.

II. The question of increased allowances to the observatories was then considered, and it was resolved—

α. That in the case of Valencia an increase of salary be recommended of 1*l*. per month in the case of Sugrue ; of 3*s*. per week in the case of Brennan.

β. That in the case of the other three observatories, viz., Armagh, Falmouth, and Stonyhurst, the following reply be sent :—

" Your application has been under consideration, but no decision can be come to respecting " it during the present financial year. It will be reconsidered as soon as the allowance for " Meteorology for the next financial year has been voted by Parliament."

III. The relations between the Council and the Meteorological Society were then considered.

Mr. Scott reported that Mr. Eaton, the President of that Society, had requested him to bring before the Council the circumstance that the present allowance of 5*l*. per station, or 70*l*. per annum, was insufficient to defray the cost of supplying the required information.

Recommended, that the sum of 100*l*. per annum be allowed to the Meteorological Society to defray clerk's expenses in copying the returns to be furnished by the Society to the Office, to take effect for 1877.

It having been explained to the Committee that it would take about two days' work to examine one week's returns from the 14 stations of the Meteorological Society—

Recommended that such an examination be occasionally carried out.

Recommended that the question of inspecting the stations of the Meteorological Society from which returns are received, be considered at an early meeting of the Council.

IV. The Secretary stated that he had received specimens of the Greenwich curves, and submitted specimens of the curves engraved on the same scale as those from Kew. He reported that the exact meaning of certain figures marked on the curves was not stated, and he was instructed to write to Sir G. Airy to inquire the meaning of the figures in question, and also to ask for the entire series of curves for the year 1875.

He was also instructed to prepare an estimate of the cost to the Office of dealing with these curves.

V. Quarterly Weather Report. Recommended that the publication of the curves in the Quarterly Weather Report be continued in the present form to the end of 1877.

It was further recommended that the advisability of trying Mechanical Meteorographs, such as Theorell's, be considered.

VI. Reproduction of the Kew Electrograms. Mr. De La Rue stated that he would endeavour to make arrangements with Mr. Whipple for determining the scale of the electrograph at his own laboratory.

VII. Issue of Agricultural Intelligence. Submitted a proposed Form (Minutes, p. 11). The Secretary was instructed to print it and distribute it to the Council.

VIII. The subject of the Barometer Manual was then taken up (Minutes, p. 8), and the Chairman stated that he considered that the first portion of the Manual might be so modified as to obviate the objections which had been raised to it.

Suggested that the sections on Weather Telegraphy and Storm Warnings be separated from the rest of the Manual, and that their issue be postponed for the present.

The Committee then adjourned.

Resolved—That the question of publishing the Barometer Manual be adjourned.

Subject to this resolution the whole Report was adopted.

Submitted—The following Report:—

MEMORANDUM on the present CONDITION of the OFFICE as regards WORK and HOURS of ATTENDANCE.

IT may be considered advisable for me to present a formal Memorandum to the Council on the present condition of the Office, inasmuch as the amount of money earned by the staff at overtime has reached a very high figure, and on many grounds it seems unadvisable that such a state of things, originally intended to be merely of a temporary nature, should be allowed to continue, unless its continuance be in any degree unavoidable.

The amount of work in the Office in all its branches overtasks its present staff, and while there are no funds available for a present increase of that staff, I would request the Council to give me authority to regulate, to the best of my judgment, the amount of work to be undertaken by the Office, on the lines laid down in the following remarks.

In addition to the regular work of the different departments the following special investigations are in hands—

In *Ocean Meteorology:*

A. The extraction of Synchronous observations from logs for the U.S. Signal Office.

*B. The revision of the paper on the weather of August 1873.

In *Land Meteorology:*

*C. Determination of the scales of the Barographs.

D. Tabulation of Bermuda anemometry.

In *the Telegraphic Room:*

*E. Discussion of results of temperature observations on the Pagoda.

F. Calculation of mean pressure for each direction (16) of the wind for the telegraphic stations.

*G. Calculation of monthly prevalence of cloud at the telegraph stations, to compare with Wild's results from Russia, and Hellmann's results from Spain.

In *Mr. Strachan's hands:*

H. A discussion of all good Arctic data which are accessible.

I. The sea temperature round the coasts of England and Ireland.

Much of this work is done in office hours, and many of the clerks work at their ordinary work after hours. The investigations marked * will be soon completed.

I now come to the regulations for doing the work.

The Office, like Government offices, is open from 10 to 4, *i.e.* for 6 hours.

All the staff are allowed to work at overtime at the following rate of increase of pay.

1*s.* 3*d.* per hour for clerks on the regular staff, receiving annual salaries.

1*s.* per hour for temporary clerks receiving over 1*l.* per week.

9*d.* per hour for boys, paid under 1*l.* per week.

Exceptions to this rule have existed in the Telegraph Room, and formerly in the Pantagraph Room.

In the Telegraph Room attendance is in two shifts of 8 hours each—

8.30 a.m.—4.30 p.m. and 1—9 p.m.

The time from 8.30 to 5 p.m. is paid for at the same hourly rate as the several clerks receive.

The four hours after 5 p.m. are paid for at 1½ times the hourly rate of pay.

On Sundays the allowance for the hours of work has been twice the ordinary rate of pay, and on *Sunday mornings* this has been considered to include the time the clerk was necessarily absent from his own home.

In the Pantagraph Room the work has sometimes been done as piece work, a definite price being allowed for each plate. This arrangement is not now in force.

I would now submit that the Office may be considered as one department, except as regards Telegraphy, which demands late hours and Sunday attendance, and must therefore be considered by itself. The staff have been consulted as to their wishes, and a large majority would prefer that overtime work should be abolished and the office hours be extended to 8 instead of 6, viz. from 9 to 5. (It should also be noticed that no real check can be kept on the work done out of hours, on the present system).

Salaries to be calculated from six hours as in the Government Offices, and the extra pay to be one-third of each clerk's pay, *i.e.* for two hours' extra attendance.

The total amount paid to clerks, exclusive of the Telegraph Room, office keeper, and engraver, during the last six months, ending September 30, has been—

	£	*s.*	*d.*			
In salaries - - - -	1,020	10	0			
For overtime - - - -	381	16	10			
				£1,402	6	10

The scale now proposed would have made this in the same period—

	£	*s.*	*d.*			
Salaries (exclusive of office keeper) -	970	10	0			
Two hours' overtime (one-third of salary) -	323	10	0			
Office keeper - - - -	50	0	0			
One hour overtime (one-sixth of salary) -	8	6	8			
				£1,352	6	8
Total saving - -				£50	0	2

This is for six months.

I now come to the Telegraph Room, and must premise that the Council will recognise that late hours and Sunday work deserve extra pay, owing to the enforced absence from home at such times.

The work requires that the Office should be open, except on Sundays, from 8.30 a.m. to 9 p.m., and it is carried out by four clerks, in shifts of two each, with assistance from boys at regular office hours, which latter receive increased pay for overtime at the same rate as the non-telegraphic staff.

I would, therefore, suggest that this branch of the Office should be worked in nine-hour shifts, viz., 8.30 to 5.30; noon to 9 p.m.

The clerks who attend the early shift to be allowed the usual half hour for dinner; those who take the late shift to be allowed two half hours for dinner and tea.

Sunday work to be continued, as at present, at double the rate of hourly pay for all the time actually engaged on the service at the Post Office or at the Meteorological Office.

I would leave it to the Council to make some allowance for the time occupied in going to and from the Post Office, which exceeds 2 hours per day in most cases.

The amount received by the Telegraph Room in the past six months (ending September 30) has been, exclusive of Sunday pay—

	£	s.	d.	
In salaries - - - -	349	14	0	
For overtime - - -	268	16	10	
				£618 10 10

The scale now proposed would have made this sum—

	£	s.	d.	
In salaries - - - - -	349	14	0	
Three hours' overtime (half salary) - -	174	17	0	
Extra for late hours (one-sixth salary of four clerks)	43	0	0	
				£567 11 0
Total saving - -				£50 19 10

The allowance for Sunday work is left for the decision of the Council, the amount which has been paid for it during the past six months being 35*l.* 14*s.*

Proposals.

I would, therefore, propose that from and after January 1, 1878, the principle of payment for overtime by an hourly scale of increased remuneration be abolished.

That the hours of the Office shall be eight, except in the Telegraph Room, where they shall be *nine*, some of these hours being late.

I would further propose that if any of the telegraphic staff prefer to work for eight hours only they should be permitted to do so.

That the increase of pay be strictly proportional to the length of time employed, and to the existing salary of each clerk.

That though overtime is not absolutely abolished, no work shall be done by it except such fortuitous pieces of work as copying synchronous data for Captain Hoffmeyer or General Meyer; or the inquiry into the Meteorology of the Arctic Regions, now in Mr. Strachan's hands.

All such work to be undertaken on definite terms signed by the Secretary, and paid for either as piecework, or by a honorarium at the end, to be fixed by the Council.

The salaries all round to be increased in the proportion mentioned in the body of the foregoing Memorandum.

The total saving being nearly 200*l.* a year, I hope that the arrears of work in the Office will be in great measure overtaken by the extra attendance proposed. If this be not the case by Easter the staff should be increased.

At present I would ask for a boy at a weekly pay of, say, 12*s.* to aid in the despatch, &c. of the Daily Weather Reports.

I should say, in conclusion, that the question of the employment of female labour has been under consideration, but the difficulties presented by it are serious.

I should also express my sincere thanks to Mr. De La Rue for the pains he has taken to assist me in preparing this Memorandum.

ROBERT H. SCOTT,
Secretary.

The principles embodied in the foregoing Memorandum were approved, and the plan directed to be carried out January 1, 1878.

The Secretary was authorised to allow in some cases a reduction in the number of hours of work to not less than six, with a corresponding reduction in pay.

With reference to the Sunday morning attendance, the clerks engaged to be allowed to charge single time for the period occupied in going to and from the General Post Office.

SUBMITTED—The following STATEMENT respecting the RECORDS for August 1877, received from the SELF-RECORDING OBSERVATORIES, which have been examined at the METEOROLOGICAL OFFICE (see Minutes 21st December 1868).

——	Aberdeen.		Armagh.		Falmouth.		Glasgow.		Kew.		Stonyhurst.		Valencia.	
ANEMOGRAPH :—														
Action - - - - - -	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Fair.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Indifferent.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Good.
Records deficient, due to stoppage of clock -	0	0	0	0	0	0	2 hrs. lost	2 hrs. lost	0	0	0	0	0	0
„ „ other causes - -	0	0	0	0	0	*1 hr. lost	†2hrs.lost	0	0	0	0	0	0	0
Orientation verified - - - -	—	—	31st	—	14th	—	25th	—	—	—	30th	—	16th (?)	—
No. of errors discovered by subsidiaries -	0	0	0	1	0	0	1	4	0	0	0	0	0	3
„ „ irregular differences	0	0	1	0	0	0	0	0	0	0	5	0	0	0
Result of 40 *Remeasurements :—*														
Greatest difference - - - -	0·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	2·0
Mean difference irrespective of sign - -	0·0	0·4	0·3	0·3	0·1	0·4	0·0	0·5	0·0	0·3	0·2	0·3	0·0	0·7
Residual difference (— Meteorological Office) -	0·0	0·0	−0·1	+0·1	−0·1	0·0	0·0	+0·1	0·0	0·0	−0·1	0·0	0·0	+0·1
RAIN GAUGE :—														
Action - - - - - -	Good.		Good.		Fair.		Good.		Good.		Good.		Good.	
Records deficient, due to stoppage of clock -	0		1 hr. lost.		0		0		0		0		0	
„ „ other causes - -	0		0		0		0		0		0		0	
Errors in tabulation - - - -	0		0		7		0		0		9		0	

BAROGRAPH :—

Action	Good.	Good.	Good.	Good.	Good.	Good.	Good.
Photography	Do.	Do.	Do.	Fair.	Indifferent.	Do.	Bad.
Records deficient, due to stoppage of clock	0	0	0	15 hrs. lost	0	0	0
,, ,, failure of light	0	0	2 hrs. lost	13 hrs. lost	0	0	0
,, ,, other causes	0	2 hrs. lost	* 4 hrs. lost	‡ 48 hrs. lost	‡ 13 hrs. lost	0	‡ 16 hrs. lost
No. of errors discovered—							
In entry of standard	0	3	1	1	2	0	0
,, calculating residual correction	1	3	0	2	0	2	0
,, applying residual correction	1	2	0	3	0	1	0
,, subtraction in subsidiary tables	0	0	1	1	0	1	3
,, tabulation by subsidiaries	0	0	0	0	0	0	0
,, ,, irregular differences	0	0	0	0	0	0	0
Result of 40 *Remeasurements :—*							
Greatest difference	0·005	0·005	0·005	0·005	0·005	0·005	0·005
Mean difference irrespective of sign	·0026	·0029	·0032	·0022	·0021	·0027	·0026
Residual difference (— Meteorological Office)	+·0001	—·0006	—·0007	+·0009	+·0003	—·0016	—·0006
Mean monthly difference between simultaneous barograph and barometer readings	·0018	·0023	·0021	·0020	·0022	·0017	·0014

THERMOGRAPH :—

Action	Good.		Good.		Good.		Good.		Good.		Good.		Good.	
Photography	Do.		Do.		Fair.		Fair.		Indifferent.		Do.		Bad.	
	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
Records deficient, due to stoppage of clock	0	0	1 hr. lost	1 hr. lost	4 hrs. lost	4 hrs. lost	0	0	0	0	0	0	0	0
,, ,, failure of light	0	0	0	0	7 hrs. lost	1 hr. lost	0	0	0	0	0	1 hr. lost	0	0
,, ,, imperfectly moistened bulbs	—	0	—	0	—	2 hrs. lost	—	0	—	0	—	0	—	1 hr. lost
,, ,, partially frozen	—	0	—	0	—	0	—	0	—	0	—	0	—	0
,, ,, other causes	§18 hrs.lost	0	0	0	*1 hr.lost	*‡4 hrs.lost	‡24 hrs.lost	‡16 hrs.lost	0	0	0	0	0	0
No. of errors discovered in entry of standard	1	2	2	0	0	0	0	6	0	0	0	0	0	0
,, ,, by subsidiary measurements	0	0	0	0	0	0	0	0	0	0	0	0	0	0
,, ,, of subtraction in do. tables	0	0	1	0	1	0	0	0	0	2	1	0	2	0
,, ,, detected under glass scale	0	0	1	1	1	2	0	0	1	3	7	2	1	0
Result of 40 *Remeasurements :—*														
Greatest difference	0·3	0·3	0·3	0·2	0·2	0·2	0·2	0·2	0·3	0·3	0·3	0·3	0·3	0·3
Mean difference irrespective of sign	·08	·12	·10	·06	0·5	·07	·09	·10	·10	·09	·16	·15	·08	·09
Residual difference (— Meteorological Office)	—·07	—·11	—·09	·00	—·01	—·01	—·06	—·07	—·05	—·01	—·15	—·15	+·06	—·04
Mean monthly difference between simultaneous thermograph and thermometer readings	·21	·20	·14	·17	·09	·18	·15	·15	·14	·22	·14	·19	·15	·27
No. of errors in maxima and minima	0	—	3	—	2	—	1	—	5	—	1	—	0	—

* Instrument under inspection. † Counterpoise of pencil displaced. ‡ Owing to bad photography. § Bad action of light shutter.

Read—The following letter :—

M.O. 2339.—P. 10,722.

SIR, Stationery Office, November 13, 1877.

WITH reference to your demand of the 10th instant, No. 1131, asking for 500 copies "Plates of Instrumental Curves," I have the honour to draw your attention to the enclosed Treasury instructions, limiting the gratuitous issue of departmental papers to 50 copies, and I should feel obliged if you would be so good as to state for what purpose it is intended to use the 500 copies applied for.

I have, &c.
(Signed) T. D. PIGOTT,
Controller.

The Director, Meteorological Office.

The Secretary was instructed to reply as follows, explaining the reason for demanding the 500 copies, and referring to former grants :—

SIR, November 16, 1877

I BEG to acknowledge the receipt of your letter of the 13th instant (No. 10,722) respecting our requisition for 500 copies of the Quarterly Weather Report for 1875, Part 3, and, in reply, I am directed by the Meteorological Council to inform you that the copies are required for gratuitous distribution to scientific men and scientific institutions at home and abroad, in return for publications, and also to persons who observe gratuitously for the Office, and who have furnished the materials from which the work has been constructed, in accordance with the letter from the Treasury dated 29th December last, in reply to a similar inquiry by your Office referring to our requisition for 1,250 copies of the Remarks to accompany the Monthly Charts of Meteorological data, Official No. 27.

I am, &c.
(Signed) ROBERT H. SCOTT,
Secretary.

The Controller, H.M. Stationery Office.

Reported—That the accounts for the six months ending September 30 were ready to be forwarded to the Audit Office.—The Chairman and Mr. Galton were requested to audit these accounts in accordance with the resolution (Minutes, p. 17).

Read—A letter from Captain Toynbee submitting the following logs :—

Observer.	Ship.	Period.	Voyage.	Last Mention on Minutes.
Capt. T. W. Freeman	S.S. "Nestor" -	June 27—Oct. 27, 1877.	Liverpool to Shanghai, and thence to London (both viâ Suez).	1876, p. 107.
Capt. James Buchan	Barque "Commewyne."	May 11—Oct. 23, 1877.	Glasgow to Surinam and back.	(Committee) 1877, p. 1.

The Hydrographer having asked for information as to the tests applied to the logs, the Secretary was instructed to reprint from the Report of the Proceedings of the Conference on Maritime Meteorology, London, 1874 (Official No. 23), p. 35, the following Form, which has been filled up and inserted in every log in the Office :—

The Form has been based on the "Directions how a log should be examined," by Captain Toynbee, Minutes, 1869, p. 52, which directions were approved of by Captain G. H. Richards, then Hydrographer (Letter 566/69).

FORM FOR TESTING LOGS.

No. OF LOG. DATE. NATURE OF VOYAGE. CHARACTER. CAPTAIN. Observer's Rank (hours he observed). SHIP.	Commencing From For whole of Log	Ending To Keeper of Log. Wood or Iron	Steam or Sailing
BAROMETER.	INSTRUMENTS. No. Height of Cistern feet.		
THERMOMETERS.	Sea surface No.	Dry Bulb No.	Damp Bulb No.
HYDROMETER.	No.		

FORM FOR TESTING LOGS—*cont.*

ENTRIES. Character.	Hours when observations are given ? Hours taken for extraction ? Did ship pass to eastward of Cape Verd Islands on outward passage ? Are there too many entries of " Do." instead of observations ?
SHIP'S POSITIONS. Character.	Are observed and D. R. positions given throughout ? Is there any evidence of positions being good or bad ? Is D. R. longitude carried on from last land seen ?
CURRENTS. Character.	Given by Captain ? Are they correctly calculated ? Are data regularly given ? Do results seem probable ?
SEA TEMPERATURES. Character.	Average number of observations daily ? Name tests. Obs. read to
SPECIFIC GRAVITY. Character.	Average number of observations daily ? Do they range lower in Doldrums ? Correction ?
COMPASS ERRORS. Character.	Are there data for obtaining the actual compass errors ? Do they agree with Admiralty chart ?
SHIP'S HEAD. Character.	Is it generally given ?
WINDS. Character.	Direction : Are changes carefully given ? Force : Are changes carefully given ? „ Does it agree with distance run ?
BAROMETER. Character.	Is daily range regularly shown in tropics ? Does pressure decrease when approaching Equatorial Doldrums ? Does pressure increase when leaving Equatorial Doldrums ? Does the barometer rise or fall in accordance with Buys Ballot's law ? Is there evidence of repetition or interpolation ? Is attached thermometer always given ?
DRY AND DAMP BULBS. Character.	Are they in the open air, showing diurnal range ? Any signs of being in sun ? Is there a fair difference ranging with weather ? Corrections ? Obs. read to
CLOUD. Character.	FORM : Well given ? Regularly given ? Simple and compound well separated ? AMOUNT : Cloud or clear sky ? Scale 0 to 10 ? DIRECTION UPPER : From or to ?
WEATHER. Character.	Is it fairly represented ? Is the entry " Do." used frequently ? Can it be got from remarks ?
REMARKS. Character. HYDROGRAPHICAL NOTICES. DIAGRAMS.	Is state of sea given ? Are any interesting facts given ? Are they full or scanty ?

(*On the back.*)

OUTWARD PASSAGE.						
Date.	CURRENTS.		WIND FORCE.			
	D. Lat.	Dep.	Distance in.		Distance run.	Knots per hour.
			Lat.	Long.		

HOMEWARD PASSAGE.						
Date.	CURRENTS.		WIND FORCE.			
	D. Lat.	Dep.	Distance in.		Distance run.	Knots per hour.
			Lat.	Long.		

The character of each style of observation is recorded under the word "character," and the general character of the whole log [1, *Excellent;* 2, *Very good;* 3, *Good;* 4, *Middling;*] is deduced from these and recorded on the upper part of the testing form. The greatest weight being given to wind, barometer, and thermometer observations.

Submitted—A letter, No. 1995, from H. Thatcher, Cardiff, requesting to be appointed agent for that port. The Secretary explained that there was no agency on the coast of the Bristol Channel at present.—Agreed that Mr. Thatcher be appointed agent.

Reported—That the Daily Weather Charts had been supplied to Mr. Buchan.

Submitted, in accordance with instructions at last meeting, the following Charts, for the months of February and August respectively, for a Two-degree Square, 36–38° S. lat., 20°–22° E. long., off the Agulhas Bank, containing the subjoined information :—

A. Winds and Currents.
B. Temperature (Air and Sea), and Barometer.

The period embraced by these charts was from 1856 to 1862.

The Council then adjourned.

116, *Victoria Street, December* 5, 1877.

PRESENT :

PROFESSOR H. J. S. SMITH IN THE CHAIR.

MR. GALTON. | THE HYDROGRAPHER.
PROFESSOR STOKES.

The Secretary was in attendance.

The Minutes of last meeting (Nov. 15) were read and confirmed.

The proposed Form for Agricultural Intelligence (Minutes, p. 35) was submitted and amended by the Council. The Secretary was instructed to have it set up in type as amended, and sent in the first instance to Mr. Caird for his opinion, and then after revision by Mr. Galton and the Chairman, to the Royal Agricultural Society, Prof. Voelcker and others, for their opinions.

Read the following letter—

M.O. 2497.

SIR, Meteorological Society, Westminster, December 4, 1877.

THE Council of this Society find that the frequent and regular inspection of their stations, and the reduction, &c. of the observations supplied to the Meteorological Office, have entailed on the Society an expense considerably in excess of the amount paid to them, so that but little time and money can be devoted to the other work they desire to carry out. They therefore will be glad for the arrangement now in force to be reconsidered, with the view not only of increasing the annual payment per station, but also of granting a separate sum towards the cost of inspecting the stations, which will have to be done, under the circumstances, more often than if the observations were required only for the use of the Society.

They would also be pleased if the Meteorological Council would, under these circumstances, increase the payment for this year's observations by the sum of 30*l.*, so as to bring their expenditure and receipts in this matter more into perfect accord.

Yours &c.
(Signed) JOHN W. TRIPE, M.D.,
Council Secretary.

R. H. Scott, Esq., F.R.S.
Secretary to the Meteorological Council.

Mr. Scott was instructed to send the following reply in accordance with the Minutes of last meeting :—

SIR, December 6, 1877.

I AM instructed by the Council to say that they are prepared to comply with the request of your Council to increase, to the extent of Thirty Pounds (30*l.*), the amount paid to the Society for the returns supplied to the Meteorological Office for the year ending March 31st, 1878.

The question of allowance for inspection, &c., must be postponed till the next financial year.

Yours, &c.
(Signed) ROBERT H. SCOTT,
Secretary.

John W. Tripe, Esq., M.D.,
Council Secretary, Meteorological Society.

Submitted—The following Report on the examination of one week's records received from the Society, in pursuance of the instructions contained in last Minutes.

December 4, 1877.

I HAVE examined the returns received from the Meteorological Society for the week Feb. 11th—17th, 1877, with the following results:—

Hawes.—Nothing to note.

Wakefield.—15th, 9 p.m. Barometer reading (29·728) is apparently one tenth too high.

Kelstern—Nothing to note.

Buxton. Nothing to note in the period mentioned above, but on the 18th at 9 p.m. the barometer reading (29·732) should be apparently 29·932.

Hillington.—Nothing to note.

Mellington Hall.—Nothing to note.

Hereford.—Nothing to note.

Carmarthen.—Nothing to note.

Marlborough.—Dew point at 9 a.m. 13th is incorrect, as is also the elastic force. Dew point is given 44·2, should be 46·1. Elastic force is given ·290, should be ·313.

Strathfield Turgiss.—Nothing to note.

Ramsgate.—Nothing to note.

Dartmoor.—11th, 9 p.m. Barometer reading (30·109) appears to be much too high. 12th, 9 p.m. Barometer reading appears too high. 14th, 9 a.m. and 9 p.m. Barometer readings appear too high, though the error in these two last cases is not so great. 15th, 9 a.m. Dew point and elastic force are incorrect. Dew point is given 43·4, it should be 44·3; elastic force is given ·281, it should be ·293

Babbicombe.—Nothing to note.

Audley End.—Nothing to note.

J. A. CURTIS,
4/12/77.

R. H. Scott, Esq.

Mr. Scott stated that in his opinion the result of this examination was on the whole very satisfactory. The Society was taking measures to improve the barometrical readings at Princetown, Dartmoor, but possibly the discrepancies there noticed might be due to the fact that at the high level of the station (1,400 ft.) the curve for pressure did not run quite parallel to a curve for a station near sea level in the vicinity (*vide* Comptes Rendus, vol. LXXXV., p. 529).

The Secretary reported that he had received the following private letter from the Post Office (*vide* Minutes, 1875, p. 50).

M.O. 2517.

DEAR MR. SCOTT, General Post Office, November 17, 1877.

WE are making up our estimates for next year. If you are in a position now to state that you can guarantee a sufficient number of messages from Mullaghmore, as explained in my last letter to you, will you write to us officially, and we shall then be able to ask for the money required for the extension in our Estimates.

Yours, &c.
(Signed) C. H. B. PATEY.

R. H. Scott, Esq., F.R.S.

The Secretary reported that he had received a letter (No. 2467) from the Post Office, containing suggestions for a modification of the Weather Telegraphic Code, so as to ensure more accurate transmission of the reports. He had replied (letter 2242), pointing out that the change proposed by the Post Office could not well be carried out, but professing his readiness to confer with the Post Office authorities on the subject.

The Secretary reported that he, in conjunction with Mr. W. Galloway, proposed resuming the comparison between the dates of colliery explosions and the curves of pressure and temperature, of which a portion had been printed in the Proceedings of the Royal Society, vol. XX. p. 292. He had requested the Home Office (letter 2112) to supply him officially with certain returns, and had received in reply a letter (No. 2469) asking whether or not he made this application in the name of the Council.

He was authorised officially to request the Home Office to procure from the several inspectors the complete list of all explosions (fatal and non-fatal) which have occurred in their respective districts during 1873, 4, 5, 6, and 7.

The Secretary reported that for some time past Mr. Strachan had been discussing the Meteorological Observations taken by various British exploring expeditions in the Arctic Regions, and as some portion of the work was nearly ready for press he submitted the following memorandum:—

IN the progress of preparing for discussion observations made in the Arctic Regions, I have become impressed with the importance of discussing in the first instance those made at stations or winter quarters, for I think that the results to be obtained from them will indicate the method

which will be advisable to adopt in treating the observations made in the adjacent seas. Up to the present time the observations at such stations which have been taken in hand are:—

Gulf of Boothia, "Victory" beset, hourly observations, two years.
Frozen Straits, "Terror" beset, bi-hourly „ one year.
Griffith Island, "Resolute" „ „ „ „
Northumberland Sound, "Assistance" beset, four-hourly observations, one year.
Wellington Channel, „ „ „ „ „
Cresswell bay, "Fox" beset - - „ „ „

As it is necessary for the purpose of determining the diurnal range of the meteorological elements to write out monthly tables of pressure, temperature, wind, &c., and as such tables are frequently published *in extenso*, it becomes a question which requires to be settled before further progress can be made with the reductions, whether the Council will elect to print such tables in detail, or to give only the results? My own opinion is that there is very little necessity to print the observations in detail, and that the means and extremes properly carried out are sufficient. However, in either case, I am only waiting for a decision on this question to go on and finish the discussion of the data for the before-mentioned places.

R. STRACHAN,

Dec. 1, 1877.

Submitted—The following memorandum:—

EXAMINATION OF BAROGRAM SCALE-VALUES.

SIR, November 23, 1877.

THE examination into the accuracy of the scale-values of the barograms of the seven observatories connected with this office is now completed, and I beg to submit to you the following report.

The methods adopted in the examination was similar to that lately followed in the case of the thermogram scale-values. (Minutes, 1874, p. 95; 1876, p. 34). Measurements have been made at those parts of the curves for which observations of the standard barometer are recorded, using only well-defined curves, free from photographic or other imperfections, and also (in order to minimize the chance of error from unpunctuality in reading the standard) taking care that the pressure was fairly steady at the time of observation. In cases of *exceptionally* low pressure this latter rule was not strictly followed.

The measurements were made at each quarter inch, allowing a range of ·05 inch on each side of those points; thus the measures for obtaining the mean breadth of curve equalling 29·5 ins., ranged from 29·45 ins. to 29·55 ins. The *total* number of measurements used for obtaining the means was as follows:—

Valencia - -	762	Falmouth - -	1,560
Armagh - -	1,264	Stonyhurst - -	1,176
Glasgow - -	1,013	Kew - - -	1,182
Aberdeen - -	1,028		

In addition to these, a great many measurements were made for Valencia, Glasgow, and Kew, which I could not use, owing to alterations having been subsequently made either in the focus or temperature compensation of the instrument.

The following table shows the new scale-values and zero points obtained, and also those now in use:—

Observatory.	Scale-values.			Zero Points.		
	Value now used.	New Value found.	Difference of New Value from Old.	Distance from top edge equal to 30 ins.		
	1 scale inch =	1 scale inch =		Now in use.	New Distance.	Difference.
Valencia - - - -	1·515	1·541	+·026	1·574	1·593	+·019
Armagh - - - -	1·563	1·571	+·008	1·476	1·486	+·010
Glasgow - - - -	1·542	1·570	+·028	1·438	1·427	—·011
Aberdeen - - - -	1·586	1·578	—·008	1·630	1·634	+·004
Falmouth - - - -	1·515	1·525	+·010	2·187	2·180	—·007
Stonyhurst - - -	1·548	1·557	+·009	1·567	1·641	+·074
Kew - - - -	1·564	1·569	+·005	1·593	1·581	—·012

About a month's curves of recent date have in each case been measured and compared with the standard readings in order to test the accuracy of the new values; the following are the *mean* differences:—

Valencia - -	—·0044	Falmouth - -	—·0006
Armagh - -	—·001	Stonyhurst - -	+·0039
Glasgow - -	—·011	Kew - - -	—·0034
Aberdeen - -	—·0027		

The serious difference shown at Glasgow I attribute to the change of focus (?) made at the beginning of this year, and to which I have already drawn your attention. In order to reduce this error I have since made an empirical alteration in the position of the zero point (making

1·427 equal to 30·000, instead of 1·412 as given by the mean). In the cases of Valencia, Aberdeen, Stonyhurst, and Kew, the differences are almost invariably of the same sign throughout, and it might be well to alter their zero points in like manner by an amount equal to the mean difference shown above.

I have also availed myself of this opportunity to test the working of the temperature compensation attached to the barographs, and the result has been satisfactory in all cases.

At Armagh it appears at times to act by *jerks*, but Mr. Whipple suggests that this may be owing to the room in which theinstrument is placed being subject to sudden changes of temperature. I append the mean change in width of the temperature curve for a change of 10°. They, of course, vary with the scale-values of the different observatories.

Valencia - -	0·0426 inch.	Falmouth - -	0·0423 inch.
Armagh - -	0·0408 „	Stonyhurst - -	0·0402 „
Glasgow - -	0·0422 „	Kew - -	0·0380 „
Aberdeen - -	0·0382 „		

R. H. CURTIS.

Robert H. Scott, Esq.

Read—A letter from Captain Toynbee, submitting excellent logs kept by :—

Observer.	Ship.	Period.	Voyage.	Last mention on Minutes.
J. N. Jackson -	"Knowsley Hall"	Mar. 20—Nov. 23, 1877.	London to Calcutta and home.	1877 (Committee), p. 34.
Thomas Mesnard -	"Mistley Hall" -	Sept. 24, 1876—Nov. 9, 1877.	Hull to New York, thence to Liverpool, Calcutta, and London.	—
R. Peebles - -	"Otago" - -	Feb. 11—Nov. 5, 1877.	Glasgow to New Zealand and home.	1876, p. 118.

Mr. Scott was instructed to present the Charts to Captain Mesnard, and to convey to the two other gentlemen the marked thanks of the Council.

In reply to an inquiry made by the Hydrographer, he stated that since the last Council Meeting seven documents had been received and registered at the Office, of which four were ships' meteorological logs. Three of these were mentioned in the foregoing table, the fourth, by Captain T. C. Potts, was also "excellent," but being only for one passage from Calcutta to Liverpool it was not brought before the Council, as Captain Potts has already been nine times mentioned on the Minutes.

He was precluded by ill health from observing on the outward voyage.

In reply to a question by Mr. Galton, Mr. Scott stated that he estimated the total cost to the Office of each filled-up log on a general average to be nearly 5*l.*, calculated as follows :—

	£	*s.*	*d.*
Fees to agent on issue and return of instruments - - -	2	10	0
Wear and tear on a set of instruments, original value (say) 10*l.*, at 20 % - - - - - - - -	2	0	0
Carriage to and from agency, &c. - - - - -	0	10	0
	£5	0	0

The fee on supply is not paid for all short voyages, such as those across the Atlantic. Each *new* "excellent" observer entails an extra allowance of 1*l.* to the agent who induced him to observe.

The Secretary submitted the proofs of Parts I. and II. of the Quarterly Weather Report for 1875.

Part I. contains 24 pp. of the usual chronicle, and in addition App. I. and II., containing the returns for the stations of the second order in the United Kingdom for the year 1875.

Part II. contains 12 pp. of chronicle and no appendices.

He was authorised to proceed with the printing of these two parts.

He further stated that he proposed to include in Part III. five appendices, viz. :—

III. The usual tables for the seven observatories for 1875.

IV. Similar tables for the lustrum 1871–5.

As these tables are prepared for civil time (Minutes, 1873, p. 76), and as the tables for 1871–2 had been calculated for astronomical time, it had been necessary to re-compute these for civil time. Accordingly these tables so re-computed would form App. V. and VI.

VII. Means for rainfall, barometrical pressure, and air temperature from the Telegraphic Reporting Stations for the five years 1871–5, and in any cases where it was possible for the 10 years 1866–75.

He was authorised to proceed with the preparation of Part III.

The Secretary stated that he had discovered several serious errors in the reports from Wick, and he was instructed to write to Mr. Buchan on the subject with the view of his investigating the matter.

Reported—That meteorological information had been supplied since the date of last meeting to the War Office (letter 2489); rainfall in Denbighshire in 1875–6.

The Spanish Vice-Consul, Holyhead (letter 2490); wind returns for November 23, 11 a.m. to noon.

Reported—That Hugh Lynn had been engaged to assist in the distribution of the Daily Weather Reports, &c., at the salary of 12*s.* per week for the period of eight hours a day.

Reported—That the cash accounts for the half year ended 30th September 1877, were audited by the Chairman and Mr. Galton on the 21st November, and had been sent to the Treasury for the Audit Office. The receipts, exclusive of a balance of 645*l.* 19*s.* 6*d.* on the 1st April, amount to 7,002*l.* 6*s.* 8*d.* The payments amount to 6,395*l.* 7*s.* 2*d.*, leaving a balance of 1,252*l.* 19*s.* 0*d.* on the 1st October 1877, in hands and at the bank.

Reported—That the following cheques for November were drawn on the 26th of that month:—

				£	*s.*	*d.*
For Office:						
R. H. Scott	Salaries and wages			66	13	4
J. S. Harding, jun.				20	16	8
J. S. Harding, sen.				*7	14	0
T. D. Bell				8	6	8
For Observatories:						
Hopkin and Williams, chemicals				3	19	9
J. E. Cullum, Valentia				14	3	4
R. H. Curtis				14	3	4
C. H. Thompson				*6	8	0
E. G. Aldridge				*5	0	0
J. A. Curtis				10	16	8
For Telegraphy:						
Postmaster General, September				141	15	3
A. Buchan, travelling				24	2	2
F. Gaster	Computations			15	16	8
W. L. Dallas				10	0	0
F. Brodie				8	16	8
H. W. Chivers				*3	18	0
For Ocean Meteorology:						
Negretti and Zambra, repairing aneroids		24	7 0			
„ „ Board of Trade instruments		114	15 3			
				139	2	3
H. Toynbee	Computations			33	6	8
R. Strachan				20	16	8
C. Harding				15	0	0
T. E. Allen				10	16	8
H. Harris				*7	14	0
Miscellaneous:						
Negretti and Zambra, instruments bought on commission				102	16	9
J. S. Harding, jun., current expenses				150	0	0
„ „				60	0	0
				£902	3	6

* Four weeks to the 24th November.

The Council then adjourned.

116, *Victoria Street, December* 19, 1877.

PRESENT:

PROFESSOR H. J. S. SMITH IN THE CHAIR.

MR. DE LA RUE.	THE HYDROGRAPHER.
MR. GALTON.	PROFESSOR STOKES.

The Secretary was in attendance.

The Minutes of last meeting (December 5) were read and confirmed.

The question of the estimates for the Office for the financial year 1878–9 was taken into consideration. A draft form of estimate was submitted, and after discussion was ordered to be rearranged, and after being circulated among the members of Council, to be forwarded to the Treasury.

The Hydrographer submitted the following memorandum, No. II. (*see* Minutes, p. 31):

IT will be in the recollection of the members of Council, that in continuation of discussions that had taken place on Ocean Meteorology, I drew up a memorandum submitting certain points for their consideration. This memorandum was read at the meeting of October 31st last, as was also a series of remarks, or rather criticisms, on each of its paragraphs, drawn up by the Marine Superintendent: these remarks were not entered on the minutes of the day, and presumably, therefore, were considered informal.

I think the time has now arrived, both for the information of the Council, as a guide for its future line of action, and for my own personal guidance as the adviser of the Government (through the Admiralty) in all that relates to the co-operation of the officers of Her Majesty's Navy and of the Admiralty Hydrographic Department in the matter of Ocean Meteorology; that Captain Toynbee's matured views on the points raised in my memorandum should be on record as an official report.

In framing such a report, he would doubtless receive aid from other members of the Office in order to render it complete, and so far as possible exhaustive. To further this object his attention should be directed to certain correspondence which has, during the present year, passed between the Treasury and Admiralty, to be found in a printed Parliamentary paper in return to an order from the House of Commons,* dated from Treasury Chambers, 19th July 1877. From letters therein, especially those dated 24th May, 12th and 15th June, the functions and duties of the Hydrographer, both in reference to his own Admiralty department, to the Meteorological Council, and to the Government, can be clearly gathered.

For practical purposes, and in order not to encumber the report with extraneous matter, it may be assumed that paragraphs 1, 2, 3, and 4 of the Hydrographer's Memorandums are correct (or the departmental table may be accepted). This being so, paragraph 5 with its subdivisions should be exhaustively dealt with from the departmental point of view.

Paragraph 7 should receive serious consideration in connexion with paragraph 5; the recent experience gained by the department, at the instance of the Hydrographer, in connexion with the graphical representation of data both in *crowded* and *uncrowded* districts, will of course not be lost sight of in the Superintendent's recommendations on this head.

Paragraph 8 will in the main be explained by the amount of consideration paragraph 7 has received.

Paragraph 9 will be partly considered by the Superintendent's report on paragraph 5, so far as past contributions on the part of the officers of Her Majesty's Navy are concerned; but it is the action of the future that the report should mainly deal with, keeping in view the Treasury and Admiralty correspondence already referred to.

On the foregoing grounds, and on the basis laid down in the Hydrographer's memorandum, I submit as a resolution for the consideration of the Council, that the Marine Superintendent be instructed to frame a report accordingly.

I further think it would be desirable for the Marine Superintendent to append to his report an account of the special work his staff is now engaged on, and the probable time of its completion.

So far as my knowledge goes, *the whole of the staff* are now engaged transferring from logs into data books the statistics of six-10 degree squares in the neighbourhood of the Cape of Good Hope, and that this transference is estimated to be completed in August 1878.

My impression also is, that after the completion of this transference, the estimation for the time to be taken on the discussion of the data would amount to some years, on the assumption that the discussion would proceed on the lines of Square 3 and its adjacent squares, as recently published.

I further submit as a resolution that the Marine Superintendent be instructed to append a supplement to his report, detailing the above particulars, with an estimate of time on both heads.

FRED. JNO. EVANS,
Hydrographer.

* Parliamentary Paper, No. 351, session 1877.

SUBMITTED—The following STATEMENT respecting the RECORDS for September 1877, received from the SELF-RECORDING OBSERVATORIES, which have been examined at the METEOROLOGICAL OFFICE (see Minutes, 21st December 1868).

	Aberdeen.		Armagh.		Falmouth.		Glasgow.		Kew.		Stonyhurst.		Valencia.	
ANEMOGRAPH:—	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.
Action - - - - - -	Good.	Good.	Good.	Fair.	Good.	Good.	Good.	Fair.	Good.	Good.	Good.	Good.	Good.	Good.
Records deficient, due to stoppage of clock -	0	0	8 hrs.	9 hrs.	0	0	0	0	21 hrs.	22 hrs.	0	0	0	0
„ „ other causes -	*1 hr.	*2 hrs.	*†10 hrs.	*7 hrs.	‡2 hrs.	‡3 hrs.	*33 hrs.	*55 hrs.	0	0	*6 hrs.	*6 hrs.	0	*1 hr.
Orientation verified - - - - -	15th	—	—	—	12th	—	—	—	22nd	—	22nd	—	—	—
No. of errors discovered by subsidiaries -	0	0	0	2	0	1	0	0	0	2	0	1	0	1
„ „ irregular differences	0	0	0	0	0	0	0	0	0	0	0	0	0	8
Result of 40 *Remeasurements*:—														
Greatest difference - - - -	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0
Mean difference irrespective of sign - -	0·1	0·5	0·1	0·4	0·0	0·4	0·1	0·3	0·2	0·3	0·1	0·4	0·0	0·5
Residual difference (— Meteorological Office) -	−0·1	+0·1	−0·1	−0·1	0·0	0·0	0·0	−0·1	+0·2	0·0	−0·1	0·0	0·0	−0·2

RAIN GAUGE:—														
Action - - - - - -	Good.		Good.		Fair.		Fair.		Good.		Good.		Good.	
Records deficient, due to stoppage of clock -	0		§§24 hrs.		7 hrs.		0		0		0		0	
„ „ other causes - -	*2 hrs.		0		§10 hrs.		0		0		0		0	
Errors in tabulation - - - -	0		0		0		0		0		14		1	

BAROGRAPH :—

Action	Good.	Good.	Good.	Good.	Good.	Good.	Good.
Photography	Fair.	Do.	Fair.	Do.	Fair.	Do.	Indifferent.
Records deficient, due to stoppage of clock	0	*9 hrs.	1 hr.	0	5 hrs.	0	*1 hr.
„ „ failure of light	0	0	0	*1 hr.	0	2 hrs.	2 hrs.
„ „ other causes	0	0	‖9 hrs.	0	0	0	‖66 hrs.
No. of errors discovered—							
In entry of standard	0	5	0	3	0	3	0
„ calculating residual correction	0	1	3	4	0	2	2
„ applying residual correction	0	4	1	1	5	0	1
„ subtraction in subsidiary tables	0	0	0	0	0	0	0
„ tabulation by subsidiaries	0	0	0	0	0	0	0
„ „ irregular differences	0	1	0	0	0	0	0
Result of 40 *Remeasurements :—*							
Greatest difference	0·005	0·005	0·005	0·005	0·005	0·005	0·005
Mean difference irrespective of sign	0·0019	0·0032	0·0024	0·0020	0·0027	0·0028	0·0028
Residual difference (—Meteorological Office)	—0·0003	—0·0007	—0·0001	+0·0004	+0·0002	+0·0017	—0·0019
Mean monthly difference between simultaneous Barograph and Barometer readings	0·0017	0·0023	0·0020	0·0020	0·0022	0·0019	0·0014

THERMOGRAPH :—

Action	Good.		Good.		Good.		Good.		Good.		Good.		Good.	
Photography	Do.		Fair.		Do.		Do.		Do.		Do.		Indifferent.	
	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
Records deficient, due to stoppage of clock	0	0	*††21 hrs.	*††21 hrs.	0	0	0	0	0	0	0	0	*2 hrs.	*2 hrs.
„ „ failure of light	*1 hr.	*1 hr.	0	0	0	0	0	0	0	0	0	0	0	7 hrs.
„ „ imperfectly moistened bulbs	—	0	—	0	—	24 hrs.	—	1 hr.	—	1 hr.	—	1 hr.	—	0
„ „ partially frozen	—	0	—	0	—	0	—	0	—	0	—	0	—	0
„ „ other causes	0	0	0	0	‖2	‖3	0	0	0	0	0	0	0	0
No. of errors discovered in entry of Standard	0	0	0	1	0	0	0	1	2	2	0	1	0	3
„ „ by subsidiary measurements	0	0	0	0	0	0	0	0	0	0	0	0	0	0
„ „ of subtraction in do. tables	0	0	0	0	0	0	0	0	4	0	0	0	0	0
„ „ detected under glass scale	0	0	8	2	0	**48	1	4	1	2	10	0	0	0
Result of 40 *Remeasurements :—*														
Greatest difference	0·2	0·2	0·3	0·3	0·3	0·3	0·2	0·3	0·3	0·3	0·3	0·3	0·3	0·3
Mean difference irrespective of sign	0·07	0·11	0·15	0·15	0·09	0·16	0·08	0·10	0·10	0·11	0·13	0·14	0·12	0·11
Residual difference (—Meteorological Office)	—0·06	—0·11	—0·14	—0·11	—0·08	—0·15	+0·03	—0·06	—0·02	0·00	—0·11	—0·12	+0·08	0·00
Mean monthly difference between simultaneous Thermograph and Thermometer readings	0·17	0·16	0·14	0·20	0·08	0·17	0·15	0·15	0·21	0·22	0·14	0·18	0·12	0·39
No. of errors in maxima and minima	0	—	6	—	0	—	4	—	3	—	5	—	1	—

* Instrument under inspection or repair. † Pencils failed to mark. ‡ Pencils not lowered. § Pipe choked. ‖ Owing to bad photography.
** Curve re-tabulated in consequence of bad setting of scale. ††Clock stopped through bad action of light shutter. §§ Clock not started.

Resolved—That the Marine Superintendent be requested to prepare a report expressing his views with reference to the points raised in the foregoing memorandum by the Hydrographer, with a supplement as proposed by that officer.

The Secretary was authorised to have new barograph scales engraved as required, in accordance with the memorandum submitted at last meeting.

The memorandum on Arctic Meteorology submitted at last meeting was considered, and it was resolved that the observations be not printed in full, but only the results (as suggested in the memorandum in question); Mr. Strachan, however, to submit a specimen of the publication he proposed, accompanied by a specimen of his detailed original materials. Mr. Strachan to be further instructed to furnish a report on the proposed scope of his investigation into Arctic Meteorology, with an estimate of the time it is likely to occupy.

Reported—That since the last meeting four logs had been received, two of them being "excellent."

Read—A letter from Captain Toynbee submitting the above two excellent logs by—

Observer.	Ship.	Period.	Voyage.	Last mention on Minutes.
C. T. Renaut -	Ship "Pleione"	Dec. 18, 1876, to Dec. 7, 1877.	London to New Zealand, Calcutta, and home.	1876, p. 118.
W. J. L. Wharton, R.N.	H.M.S. "Fawn"	July 1—Oct. 31, 1877.	East Coast of Africa -	1877 (Council), p. 17.

The subject of the Barometer Manual was then reconsidered (Minutes, Nov. 15). The Chairman reported that he had entered into correspondence with the Rev. W. Clement Ley with the view of obtaining his services to revise and edit the proposed Manual. He had requested Mr. Ley to attend the present meeting and confer with the Council on the subject, but that gentleman was unfortunately prevented by illness from appearing.

Resolved—That Mr. Ley be requested to edit the Barometer Manual (excepting the section relating to the "Use of the Barometer to Seamen"), in co-operation with the Secretary.

Read—Letter 2605, applying for the loan of a fishery barometer to Keiss, in Caithness.—Sanctioned.

Reported—That a cheque for 30*l.* for petty cash had been drawn on the 13th instant.

Resolved—That the meetings of Council be on Fridays in future.

The Council then adjourned till Friday, January 25, 1878.

116, *Victoria Street, January* 25, 1878.

PRESENT:

PROFESSOR H. J. S. SMITH IN THE CHAIR.

MR. DE LA RUE.	THE HYDROGRAPHER.
MR. GALTON.	PROFESSOR STOKES.

The Secretary was in attendance.

The Minutes of last meeting (December 19) were read and confirmed.

Read—A letter from the Treasury (No. 125) informing the Council that the Lords Commissioners had authorised the printing of a discussion of 20 years' air temperature observations, and of 27 years' earth temperature observations which had been conducted at Greenwich, and enclosing copies of letters from the Admiralty (dated December 20, 1877) and from the Astronomer Royal (dated December 18, 1877) in relation to the proposed work.

The Secretary submitted a Memorandum from Mr. R. Curtis (letter 214) which stated that some difficulties had arisen in the reproduction of the Greenwich thermograms. Mr. De La Rue and Mr. Galton were requested to examine into the matter.

Submitted—The following Memorandum:—

REPORT on the DETERMINATION of the FRICTION CO-EFFICIENT of the KEW ANEMOGRAPH.

In the report which I presented to the Meteorological Committee, on the occasion of my recent visit to their self-recording observatories, I drew attention to the condition of the foot bearings of the velocity shafts of the anemographs, and named a suggestion of Dr. Robinson's that agate spheres should be substituted for the present simple steel surfaces, with a view to reduce the friction of the instrument.

Having registered lately what appeared to be an unusual number of periods of calm, I suspected that although the anemograph looked in good order, friction prevented its movement to a greater extent than it used to do, and determined, when opportunity offered, to make an experiment with the view of ascertaining the force required to set the cups in motion.

This opportunity presented itself on the 20th of December last, when the air was so still that the anemograph registered the passage of but one mile of wind in 14 hours (6 p.m. on the 19th to 8 a.m. on the 20th), whilst the total movement on the day did not exceed 28 miles, the smallest amount I recollect ever having been recorded in 24 hours by the Kew instrument.

The experiment was conducted in the following manner:—A pulley of polished boxwood, which turned freely, was attached to a long step ladder placed upon the roof of the sun room, at such a height as to bring it nearly on a level with the cups of the anemometer, and a long piece of sewing thread, having a hook at one end, was passed over the pulley.

The cups being observed to stand quite still, the hook was attached to the arm of the cross opposite to the centre of the cups, and weights tied on to the other end of the thread until the instrument was set in motion.

After several preliminary experiments it was found that 30 grains were required to move the cups with their convex surfaces forward, that is, in the direction in which they rotate under the action of the wind, and 50 grains moved them in the opposite direction, *i.e.*, with the concave surfaces forward.

The thread slipped over the smooth pulley without turning it, and it was found that the resistance offered by the pulley was less than one grain.

In the Report of the Meteorological Committee for 1867, page 52, it is stated that the friction co-efficient of the Kew instrument has probably been ascertained, and upon the value so determined the table of friction corrections since applied to the whole of the anemometer tabulations was constructed.

I have searched the Kew books for the account of the determination of this value, and only find the two following notes by Professor Stewart:—

"1867. *September 17th.* Tried the amount of weight that sets going one of the anemometers; this is 160 grains."

"*December 12th.* 17 grains applied by a pulley started the Kew anemograph cups, without the recording part in Munro's shop."

These two results are extremely discordant, and as there does not appear to be any record of experiments made with the anemometer geared up with the registering apparatus, I am unable to compare them with the result of my recent experiment. It is my intention, however, to repeat the

experiment the first favourable opportunity, when I shall disconnect the recording apparatus so as to make the conditions similar to those of the trial of December 12th, 1867.

Meanwhile I would respectfully venture to submit to the Council my opinion that the instrument is in its present condition sufficiently delicate for its work, and that the refinement of the agate rolling spheres is not needed.

G. M. WHIPPLE.

Kew Observatory, January 1, 1878.

The Secretary stated that he had forwarded a copy of the foregoing Report to Dr. Robinson, and had received from him the following remarks (letter 118) :—

(M.O. 118.)

MY DEAR SIR, Observatory, Armagh, January 12, 1878.

THANKS for Mr. Whipple's paper. I do not think his method likely to give good results, for however still the air may seem, there may be currents or eddies which interfere with the measure, as is obvious from his getting different results, according as the convex or concave moved forward. By a method which I think is unexceptionable (and which I hope you will soon see in my forthcoming paper) I determined by a mean of six, closely agreeing, the friction of the anemometer here to be 26·8. I am, however, uncertain whether the viscid oil interfered at that time, and I will repeat the measure.

The experimental anemometer which is set up beside the other one, gives by the same process 23·0, though its moving parts are twice as heavy as those of the Kew one.

Yours, &c.

(Signed) T. R. ROBINSON.

P.S.—In my measures the axle made from twenty to thirty revolutions.

R. H. Scott, Esq.

Read—Letter No. 133 from the editor of the "Nautical Magazine" stating that the net cost of the charts to illustrate Captain Toynbee's lecture had been 15*l.* over and above what had been calculated, and requesting the Council if possible to increase their grant of 10*l.* (Minutes, p. 11.)

Resolved—That the additional sum of 7*l.* 10*s.* be allowed to the editor in consideration of the heavy expense incurred by the Magazine.

Submitted—The following report :—

REPORT TO THE COUNCIL ON CAPT. EVANS'S MEMORANDA I. AND II.

In accordance with the Hydrographer's Memorandum No. II. (Minutes, December 19), I have carefully read the correspondence between the Treasury and Admiralty, to which he calls my attention, and think I understand it. I will therefore pass on to Captain Evans's Memorandum No. I. (Minutes, p. 31), and I propose to answer the questions seriatim, commencing, as Captain Evans suggests, with paragraph 5.

Par. 5. "*The question of dealing with this large mass of material, the collection of* 20 *years, and now lying undigested on the Office shelves, presents itself in various forms. The following appear to me as the most urgent :*

(*a.*) "*Pursuing the system of the last* 10 *years, and without reference to whether it was the best at could be desired either as to the expenditure of time or labour, or money, or the practical or scientific outcome, what will be the accumulation of undigested material* 10 *years hence?*"

Answer to (*a.*) A large amount of this "*undigested material*" is so thinly spread over comparatively little frequented parts of the sea (as appears from the 12 charts in the Report of 1876-7) that we do not see our way to working it up with advantage. At any rate we think it better to commence with those parts of the sea from which we have received a fair number of observations. In ten years from the present time we hope to have accumulated more observations in the less frequented parts, and this will enable us to work up their Meteorology with more advantage than it could be done now.

(*b.*) "*Recognising the fact that we have now more in hand, and coming in annually, than can be dealt with, should we go in the direction of strengthening the Office staff* (*branch*) *on the one hand, and curtailing the observers on the other?*"

Answer to (*b.*) I do not think that we have more in hand, and coming in annually, than can be dealt with. It must be borne in mind that, from the nature of the work, we are compelled to collect a large amount of data over those parts of the sea which have been already discussed, because observers must establish a habit of observing, so that we cannot ask them to observe in one square and desist when they enter the next. For example, we want more observations in the Pacific, but to get these a ship must pass through the most frequented Squares of the Atlantic. The log of such a ship will improve our Atlantic data as well as increase that for the Pacific, so that eventually we may be able to work up some part of the latter ocean, but it will be seen that the Pacific data in such a log cannot be advantageously worked up until it is decided that we have collected enough for some part of that ocean, whilst data from the most frequented parts of the Atlantic may be required for the revision of our published results. I allude to the possible revision of part of the Atlantic work because the instrumental observations in our later logs are better than those in earlier ones, and the growing demands of Scientific Meteorology may require us to deal with these later observations.

(c.) "*Or allowing the Office staff (branch) and collectors to remain at their present numbers; should we expand our collections in regions where the wants are assured, and close or materially curtail the collections in those regions where we have more than can at present be grappled with?*"

Answer to (c.) It would be very desirable to select observers who are voyaging to the least frequented parts of the world, if selection were in our power, but at present volunteers are so scarce that it has not been thought right to decline any good observer who offers. Another reason for not refusing good observers is because they often vary their voyages, so that although they may be going to a frequented part of the sea on one voyage, this may not be the case on the next. Our best observers like the work, and consider they get so much advantage from it, that they would object to be refused the loan of the instruments, because their coming voyage did not suit the wants of this Office. The result would be that they would decline to observe again. Here also may be repeated the argument that instrumental observations have so much improved in the later on those of the earlier logs, that the demands of Meteorology may even require the better observations which are now being taken in the most frequented parts.

Again synchronous observations, such as those of August 1873 (now in the press), show the great value of having a large number of excellent observers spread over the most frequented parts of the sea, as their observations afford a most useful check on the instrumental observations from borrowed logs. Even the observations by excellent men on our own and the neighbouring coasts (where it may be supposed there are plenty of land observers) come in very useful when working up any special weather, as sailors observe night and day, and catch important changes which are missed by landsmen.

Par. 6. "*Whatever may be the line of action adopted it can only be considered as tentative until we have before us in some intelligible shape the undigested material now in Office. It may be advanced on this head that the* 12 *charts of the distribution of existing material published in the Report of* 1876–7 *meet this want. It is true as stated in the Report that 'they give a more 'correct idea of the amount of material really available for the discussion of Ocean Meteorology 'than anything which has yet been published,' but this is not the real point; wanting fuel for our daily use, we care little about what is known of the distribution of coal seams in the country; compared with the more pressing need of what coal there is above ground, and ready to be brought to our doors. The Charts nevertheless are of real value, so far as they go, for Office work.*"

Answer to para. 6.—With regard to the first part of this remark, I think the observations of the 13 Ten-degree Squares of the Atlantic Equatorial District which are extracted into data books, but not published, are in such an "*intelligible shape*" that any experiments which the Council may think it right to make with the observations of those parts of the sea which have but little data, might be made on them.

Without referring to the simile I would ask, is it better to expend your powers on those parts of the sea where you have a reliable number of observations; being at the same time encouraged by the knowledge that the number of observations is growing in other parts; or to deal at once in an elementary way with all data that comes into the Office? So far it has been preferred by the Committee to deal with a reliable number of observations, and if the Germans deal with the data existing in our Office for the northern part of the Atlantic, and India with that for the Indian Ocean, I should feel inclined to propose that we pass from that part of the sea which lies south of Africa, to that part which lies south of Australia and in the neighbourhood of New Zealand. This opinion is supported by the fact that the Admiralty has already published very useful general charts of all oceans, and I do not think that the Council would be doing such good work by merely revising them, as by thoroughly working out the Meteorology of important parts of the sea. It will be seen that this was the ruling idea in the "Introductory Remarks" of the work on Square 3.

Para. 7. "*The quickest, the most effective at sight, and the most economical method of bringing this digest about is deserving earnest consideration. The placing the observations on properly prepared charts rather than in 'Data Books' is, I venture to think, the better course to adopt. It will be unquestionably a task of some magnitude, but not formidable, if the details be carefully worked out beforehand.*"

In his 2nd Memorandum Captain Evans says :—

"*Paragraph* 7 *should receive serious consideration in connexion with paragraph* 5; *the recent experience gained by the Department at the instance of the Hydrographer, in connexion with the graphic representation of data in* crowded *and* uncrowded *districts, will of course not be lost sight of in the Superintendent's recommendations on this head.*"

Answer to para. 7.—If the date of an observation be a fact of any value, and if it be supposed requisite to obtain means of the data for certain spaces of the sea, or if any use whatever is to be made of the remarks contained in the logs, it seems absolutely necessary that the contents of the logs should be copied out before the observations are inserted on charts. If any copying is necessary the "data books" used in the Office are very well adapted to the purpose. I have given the subject of charting most careful consideration, and have come to the conclusion that it is absolutely necessary to devise some method of representation which will give the data of the most crowded parts of the sea as clearly as that of the least crowded. I have not yet seen a better method, for this purpose, than the one in use in this Office. It will, however, be improved if the small key charts upon our larger charts are shaded to represent the disposition of data. This improvement is suggested by the charts of data which Captain Evans had plotted to illustrate his method. As the data is sifted into *one-degree Squares* by our data books, it remains in the most available

form for plotting each individual observation on a chart *when the special circumstances of any particular part of the sea require this to be done.*

The problem of obtaining barometric or thermometric means, or isobars, or isotherms from individual observations plotted on a chart, seems to be almost insoluble. Even the Wind and Current Observations, which appear to be best suited for plotting on charts, become extremely confusing when there is a large number of them in one square. Again, however small their number, it is much more easy for the navigator to compare their relative values for different points of the compass, when they are grouped for certain spaces of the sea.

Para. 8. "*Unless some such measure of digesting the accumulated material be undertaken, contributions of a general value to the science of Meteorology are at a standstill.*"

"*Although faultless accuracy be not attainable by the means at our disposal, I do not see, for example, why valuable additions should not be made—possibly amounting to a re-casting—to Dove's isothermal lines, Buchan's barometric curves, and especially to the Admiralty Wind, Weather, and Current Charts. We are told by Mr. Brassey, M.P., in the 5th (July) number of the 'Nineteenth Century' something very practical on this head.*"

Answer to para. 8.—I had hoped that the publications already issued by this Office were "*of general value to the science of Meteorology.*" In confirmation of this opinion, perhaps I may be allowed to call attention to letters lately received from the Astronomer Royal (138), Professor Buys Ballot (54), Monsieur Ploix (96), the "Nautical Magazine" (145), Mr. Eliot, of Calcutta (55). Mr. Wilfred Airy (108), Mr. Clement Ley (139), and Capt. Henderson (5), in which most of them remark on the marine work of this Office, when alluding to my paper read at the R. U.S. Institution in June last. M. Ploix proposes to translate it.

I think the latter part of this paragraph is answered by my remarks on para. 6. Perhaps it may be well to add that the method in which we have represented meteorological facts seems to me to be peculiarly well adapted for the revision of the Admiralty Wind, Weather, and Current Charts, as also of charts showing isobars and isotherms; because besides graphic representations of the prevalence of winds, calms, and currents for each month, we give their per-centages as well as the per-centage of important kinds of weather. We also give isobars and isotherms.

Para. 9. "*Whenever the Council are in a position to arrive at some fairly definite conclusion on the more prominent of the foregoing points brought under their review, I hope to be prepared to enter into special questions of detail. One of these would be the utilisation of a large collection of observations existing in the Remark Books of H.M.'s ships, specially prepared for the Admiralty Hydrographic Department.*"

"*Could we, for example, see on graphically prepared charts, such as I have sketched out, the vacant places, or areas outside the tracks of merchant ships, direct search could at once be made among these records; and what is still more to the point, instead of pursuing an aimless kind of collection, there would be no difficulty in securing the effective co-operation of the officers of H.M.'s ships when these wants were presented to them in a definite form.*"

In his 2nd Memorandum Capt. Evans says :—

"*Paragraph 9 will be partly considered by the Superintendent's report on paragraph 5, so far as past contributions on the part of the officers of Her Majesty's Navy are concerned, but it is the action of the future that the Report should mainly deal with, keeping in view the Treasury and Admiralty correspondence already referred to.*"

If I understand Captain Evans rightly, he asks me to express an opinion as to how the Officers in the Royal Navy can in future help forward the science of Meteorology.

I have thought over this question with much care, and would suggest that Meteorology is so important, and the Officers of the Royal Navy are so able, and so advantageously placed for helping it forward, that they should not be asked merely to observe in "*vacant places or areas outside the tracks of merchant ships,*" but that every ship in the Royal Navy whose size and other circumstances will permit, should record the necessary meteorological observations. This was undoubtedly the idea entertained by Capt. Beechey, R.N., and the other members of the Brussels Conference. These observations should be standards to which we could refer for corrections to the observations of ordinary merchant ships which had not verified instruments, but happened to come into the same port. The growing demand for synchronous observations makes the existence of a large number of excellent observers most important, as before remarked.

The experience of this Office shows that we can often get important facts from a ship's log, especially as to the times of changes in wind and weather, which we cannot get from even a very well-kept meteorological log. So that the most perfect log for meteorological purposes would be the ship and meteorological log combined. Although this is not possible in the Merchant Service, because the Government does not devise the form of merchant ships' logs, nor receive those logs at the end of the voyage, it is probably possible in the Royal Navy. I am inclined to think that it would be advantageous in another way, because Meteorology in the ship's log would not be considered as something extra, and each officer of the watch would be as responsible for the meteorological observations as for the other part of the log which he signs.

Of course I am not in a position to say how the detail of such a change could be best carried out, but I feel sure that if the form of the Royal Navy log were so slightly altered as to meet the present requirements of Meteorology, and if some means were adopted to insure that the observations were really good, it would be quite unnecessary that H.M.'s ships should keep a special meteorological log, and a very great help would be given to Maritime Meteorology.

Captain Evans is right in supposing that *the whole of the staff* of the Marine Room is now engaged on the six Ten-degree Squares near the Cape of Good Hope, excepting that they have to examine the latter part of the proof of the work On the Meteorology of the North Atlantic in August 1873, which is now in the lithographers' and printers' hands. The extraction of the Cape work into data books is estimated to take until August 1878, whilst the discussion and charting of it in a similar way to that of the nine squares near the Equator would probably occupy another year.

I shall be glad to bring to the notice of the Council, as soon as is convenient to them, various questions respecting the best means for discussing marine data which are the result of experience gained from the work near the Equator.

HENRY TOYNBEE,
Marine Superintendent.

It was resolved after discussion—

1. That the extraction into data books of the information contained in the logs relating to the six Cape of Good Hope squares be continued as at present.
2. That the charting of the data be now commenced and be carried on *pari passu* with the extraction into data books.
3. That Captain Toynbee be instructed to consider the question of the scale, or scales, desirable for the charts, and to prepare specimen charts on two or three different scales.

Read—A letter from Captain Toynbee stating that since the last meeting 17 logs had been received, of which the following eight had been excellent:—

Observer.	Ship.	Period.	Voyage.	Last Notice on Minutes.
Capt. E. C. Bennett	"Thessalus" -	April 24—Dec. 28, 1877.	London to Calcutta and back.	(Committee) 1877, p. 19.
Capt. C. M. Dobson	S.S. "Beta" -	May 29—Dec. 22, 1877.	Three voyages to and from Alexandria.	(Committee) 1877, p. 31.
Capt. E. Carl V. Heggum.	"Rozelle" -	Sept.3, 1876—Dec. 21, 1877.	Liverpool to Calcutta, Bourbon, Calcutta, and home.	1876, p. 118.
Capt. Saml. Morrish	"Pendragon" -	Dec.17,1876—Dec. 26, 1877.	London to Melbourne, Calcutta, and back.	——
Capt. H. Murdoch	"Denbighshire"	April 19,1877—Jan. 14, 1878.	Liverpool to Calcutta and back.	(Committee) 1877, p. 21.
Capt. R. H. Napier, Log kept by Lieut. A. Carpenter.	H.M.S. "Nassau"	May 1—Sept. 1, 1877.	Surveying in China Seas	(Council) p. 33.
Capt. Moses Parry	"Queen of Cambria"	Dec.16,1876—Dec. 8, 1877.	Sunderland to Bombay and home.	——
Capt. William Watson	S.S. "Algeria"	Aug. 18—Dec. 30, 1877.	Five voyages to New York and back.	(Council) p. 14.

The Secretary was instructed to present the Charts to Captains Morrish and Parry, and to convey the marked thanks of the Council to the six other gentlemen.

The Secretary reported that having been informed that the Post Office had withdrawn their telegraph clerk from Hurst Castle in the month of October, and that the duty of furnishing the Meteorological Reports had been entrusted to a corporal of the Royal Engineers, he had at once made inquiries as to the possibility of finding an observer at Hurst Castle who would not be liable to be called away by the requirements of military service. He had applied for and obtained permission from the Trinity House to employ their principal lightkeeper, and had appointed him to the post of Meteorological Reporter. He commenced his duties on the 1st inst., and Mr. Gaster had been sent down on the 3rd to inspect the station, and had furnished the following report:—

REPORT on HURST CASTLE TELEGRAPH STATION.

SIR, January 4, 1878.

IN accordance with your instructions I proceeded to Hurst Castle yesterday, and inspected the instruments there, and their exposure, and gave such necessary instruction to the observer (Mr. Lanceley, chief lightkeeper) as the time at my disposal would permit.

The barometers are *very* well placed in a large, well-lighted room, in which temperature is very uniform. Their cisterns are on the same level, and the indications of the two instruments agree exactly with each other, and also with the reading of my own aneroid.

The thermometers are in perfectly good order, and are unusually well exposed in a Stevenson's screen, which is placed in the garden at the lightkeeper's house. The screen is about 80 ft. from the

nearest (and *only*) wall, and opens to the northward. The wet bulb is well mounted, and from carefully comparing the instruments both in air and water I find that the

Wet bulb (unmounted) reads 0·3 lower than the *dry*.
Maximum (when set) „ 0·5 „
Minimum „ „ 1·0 „

The observer at first handled them a little carelessly, but now understands them perfectly, reads and sets them carefully, and can remount his wet bulb properly, when necessary.

The rain-gauge is about 10 feet to 12 feet from the screen, and about 80 feet from any wall. Low open fences or hedges surround the garden, and the exposure is, I think, *very* good. The rim is quite circular, and is 1 foot above the ground.

Wind.—The bearings are *true*, and force apparently well estimated. The wind is *always* observed every 4 hours, day and night, and all gales will be promptly reported.

Weather will be carefully observed and cloud formations be attended to, more especially in unsettled weather.

The observer will ascertain the exact heights of the barometers and rain-gauge above the mean sea level and report them. They are about 15 feet lower than they were prior to the 1st January 1878.

The fact which we noticed with regard to the barometrical readings seeming too low (prior to the removal of the instruments), is explained by the assistants of Corporal Gray having brought the vernier too low down in setting the instrument, so low, in fact, as to cut off *all* the rays of light from the back. I am afraid that *most* of the readings taken by Corporal Gray (or while the instruments were in his charge) and by Mr. Denham, and *some* of those by Mr. Jobbins, are about 0·3 inches too low, owing to this defect.

Should the observer be absent from his post at any time, there will be several others to take his place, all of whom will be carefully instructed.

R. H. Scott, Esq.

The Secretary submitted the amended draft form for agricultural intelligence, as adopted by Mr. Galton, with letters from Mr. Caird, Mr. Whitehead (Royal Agricultural Society), Professor Voelcker, and Mr. Gaster (Minutes, December 5). The form as now proposed was ordered to be slightly modified, and after submission to the members of Council to be adopted for publication as soon as convenient.

Reported—That the Yorkshire Philosophical Society had agreed (letter 84) to establish a station of the second order in the Museum Garden.

The Secretary reported—That he had supplied meteorological information by post and by telegraph to Mr. Dixon from the 1st inst. until the arrival of the "Cleopatra." —Approved.

The Chairman reported—That he had received a memorandum from Mr. Ley with reference to suggested improvements in the Barometer Manual, and the Secretary was directed to have it printed and distributed to the Council.

Reported—That the estimates for the ensuing financial year had been forwarded to the Board of Trade for presentation to the Treasury on the 31st ult. as directed at last meeting. The estimates had been drawn up on the following data:—

MATERIALS for PREPARING ESTIMATES for year 1878–9.

	£	s.	d.
Administration:			
(1.) COUNCIL	1,000	0	0
(2.) Secretary	800	0	0
Special Researches and Experiments	1,000	0	0
Office Expenses:			
(1.) Salaries and Wages			
Three clerks, present salary — 382 10 0			
Increments — *16 10 0			
399 0 0			
One third addition — †133 0 0			
532 0 0			
Carried forward	2,800	0	0

* Increments allowed to clerks not having reached maximum, at the rate of 10*l.* annually to the regular clerks, and 2*s.* 6*d.* weekly to the temporary ones.

† In lieu of overtime, Minutes, 15th November 1877.

	£	s.	d.	£	s.	d.
Brought forward -	-		-	2,800	0	0
Office keeper - - - - 100 0 0						
One sixth addition - - - *16 13 4						
	116	13	4			
Messenger - - - - - -	61	2	0			
	709	15	4			
				710	0	0
(2.) Rent, Fuel, and Lighting:						
Expenditure for 6 months - - - -	†280	16	6			
Estimated for year at same rate - -	561	13	0			
				570	0	0
(3.) Incidental Expenses:						
Expenditure for 6 months - - - -	†173	13	5			
Less amount repayable to the Office - -	‡12	13	10			
	160	19	7			
Estimated for year at same rate - -	321	19	2			
Contingencies - - - - -	220	0	0			
	541	19	2			
				540	0	0
Land Meteorology:						
(1.) Observatories and other Stations:						
Expenditure for 6 months - - - -	†1,172	16	5			
Less amount repayable to the Office - -	‡6	16	10			
	1,165	19	7			
Estimated for year at same rate - -	2,331	19	2			
Increase at Valencia - - - -	29	16	0			
,, to Meteorological Society - - -	30	0	0			
	2,391	15	2			
Increase to Self-recording Observatories - -	240	0	0			
Inspections - - - - - -	100	0	0			
	2,731	15	2			
				2,740	0	0
(2.) Discussion and Reduction of Observations:						
Ten clerks, present salary - - 805 8 0						
Annual increment - - - §10 0 0						
Weekly clerks, 7 at 2/6 - - - §45 10 0						
	860	18	0			
One third addition - - - - -	*286	19	4			
Stodart's wages - - - - -	109	4	0			
	1,257	1	4			
				1,260	0	0
Carried forward - - -				£8,620	0	0

* In lieu of overtime, Minutes, 15th November 1877.

† Half year ended 30th September 1877, as per statement on Minutes, p. 26.

‡ For amount included in statement of expenditure, but chargeable to and repayable by various persons.

§ Increments allowed to clerks not having reached maximum, at the rate of 10*l.* annually to the regular clerks, and 2*s.* 6*d.* weekly to the temporary ones.

	£	s.	d.	£	s.	d.
Brought forward -	-		-	8,620	0	0
Weather Telegraphy :						
(1.) Telegrams, Storm Warnings, and Reporters :						
Expenditure for 6 months - - - -	*1,365	14	1			
Less amount repayable to the Office - -	†436	4	8			
	929	9	5			
Addition for Sunday Telegraphy, stopped during 3 months, May—July 1877 - - -	66	0	0			
	995	9	5			
Estimated for year at same rate - -	1,990	18	10			
Addition for an extra station, say Mullaghmore :						
Telegrams - - - - 52 3 0						
Allowance 6*s.* per week - - 15 12 0	67	15	0			
	2,058	13	10			
Increase to reporters - - - -	150	0	0			
	2,208	13	10	2,210	0	0
(2.) Inspectors in Scotland and Ireland :						
Salaries, two at 150*l.* - - - -	300	0	0			
Travelling expenses and allowances - - -	200	0	0			
				500	0	0
(3.) Preparation, Issue, and Discussion of Weather Reports :						
Six clerks, present salary - - 648 14 0						
Annual Increments (3) - - - ‡30 0 0						
Weekly ,, (2) - - - ‡13 0 0						
	691	14	0			
One half addition - - - - -	§345	17	0			
Extra for late hours 6)546*l.* - - - -	‖91	0	0			
,, allowance for Sunday 6)546*l.* - - -	91	0	0			
Lynn's wages - - - - -	31	4	0			
	1,250	15	0			
Deduct probable amount repayable to the Office, estimated for the year at same rate as for 6 months ended September - - -	†382	0	0			
	868	15	0	870	0	0
Ocean Meteorology :						
Supply of instruments and other expenses :						
(1.) Royal Navy :						
Expenditure for 6 months - - -	*204	11	9			
Allowed for requirements of year 1878–9 -	-		-	250	0	0
(2.) Mercantile Marine :						
Expenditure for 6 months - - -	*349	16	5			
Allowed for requirements of year 1878–9 -	-		-	550	0	0
Carried forward -	-		-	£13,000	0	0

* Half year ended 30th September 1877, as per statement on Minutes, p. 26.

N.B.—Allowance made for continuance of arrangement with "Times," &c. for supply of information. No deductions made for sundry small receipts, for commission on purchases for colonies, &c., or for balance (if any) unexpended on 1st April 1878.

† For amount included in statement of expenditure, but chargeable to and repayable by various persons.

‡ Increments allowed to clerks not having reached maximum, at the rate of 10*l.* annually to the regular clerks, and 2*s.* 6*d.* weekly to the temporary ones.

§ In lieu of overtime, Minutes, 15th November 1877.

‖ One sixth of salary of 4 clerks engaged at late hours,—say two hours daily (except Sundays) at *half* regular rate of pay.

	£ s. d.	£ s. d.
Brought forward -	-	- 13,000 0 0
Reduction and Discussion of Observations and care of Instruments :		
Marine superintendent - - - -	400 0 0	
Six clerks, present salary - -	805 10 0	
Increments - - - -	*16 10 0	
	822 0 0	
One-third addition - - -	†274 0 0	
	1,096 0 0	
	1,496 0 0	
		1,500 0 0
		£14,500 0 0

* Increments allowed to clerks not having reached maximum, at the rate of 10*l.* annually to the regular clerks, and 2*s.* 6*d.* weekly to the temporary ones.
† In lieu of overtime, Minutes, 15th November 1877.

The following detailed estimate had been forwarded to the Treasury as usual:

METEOROLOGICAL OFFICE: ESTIMATES for the Year 1878–9.

	Proposed for 1878–9.	Voted for 1877–8.	1878–9. Increase.	1878–9. Decrease.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
(1.) *Administration:*				
Payment of Council - - -	1,000 0 0	*750 0 0	250 0 0	—
Secretary - - - -	800 0 0	800 0 0	—	—
(2.) *Special Researches and Experiments* -	1,000 0 0	*500 0 0	500 0 0	—
(3.) *Office Expenses:*				
Salaries and wages - - -	710 0 0	600 0 0	110 0 0	—
Rent, fuel, and lighting - -	570 0 0	570 0 0	—	—
Incidental and contingent expenses -	540 0 0	320 0 0	220 0 0	—
(4.) *Land Meteorology:*				
Observatories and other stations -	†2,740 0 0	2,230 0 0	510 0 0	—
Discussion and reduction of observations	1,260 0 0	1,100 0 0	160 0 0	—
(5.) *Weather Telegraphy:*				
Telegrams, storm warnings, and reporters - - - - -	†2,210 0 0	*2,080 0 0	130 0 0	—
Inspectors in Scotland and Ireland -	500 0 0	*250 0 0	250 0 0	—
Preparation, issue, and discussion of Weather Reports - - -	870 0 0	820 0 0	50 0 0	—
(6.) *Ocean Meteorology:*				
Supply of instruments and other expenses:				
Royal Navy - - - -	250 0 0	220 0 0	30 0 0	—
Mercantile Marine - - -	550 0 0	260 0 0	290 0 0	—
Reduction and discussion of observations and care of instruments - -	1,500 0 0	1,500 0 0	—	—
Totals - - - -	14,500 0 0	12,000 0 0	2,500 0 0	—

* These items are increased to show the allocation of supplementary vote of 2,000*l.*, referred to in Treasury letter, June 28, 1877.
† Allowance made for establishment of new stations and extension of telegraphy to Sundays.

Reported—That the following new instruments, to replenish stock, had been ordered since the meeting of 17th October, at the estimated cost (including verifications) specified:—

Board of Trade account:	£ s. d.
Maximum and minimum thermometers - - - -	0 10 6
Standard coast barometers - - - - -	66 0 0
Ordinary thermometers - - - - - -	82 16 0
	£149 6 6

SUBMITTED—The following STATEMENT respecting the RECORDS for October 1877, received from the SELF-RECORDING OBSERVATORIES, which have been examined at the METEOROLOGICAL OFFICE (see Minutes, 21st December 1868).

—	Aberdeen.		Armagh.		Falmouth.		Glasgow.		Kew.		Stonyhurst.		Valencia.	
ANEMOGRAPH :—	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Fair.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Fair.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Good.
Action														
Records deficient, due to stoppage of clock	0	0	0	0	0	0	0	0	18 hrs.	18 hrs.	5 hrs.	6 hrs.	0	0
„ „ other causes	0	0	0	*8	0	0	0	0	* 5 hrs.	* 6 hrs.	0	0	3 hrs.	0
Orientation verified	26th	—	31st	—	27th	—	3rd	—	24th	—	13th	—	17th	—
No. of errors discovered by subsidiaries	0	0	0	0	0	0	0	0	0	0	0	3	0	3
„ „ irregular differences	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Result of 40 *Remeasurements* :—														
Greatest difference	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0
Mean difference irrespective of sign	0·0	0·5	0·1	0·4	0·0	0·5	0·0	0·5	0·0	0·5	0·0	0·6	0·0	0·5
Residual difference (—Meteorological Office)	0·0	+0·1	+0·1	—0·1	0·0	0·0	0·0	+0·1	0·0	+0·1	0·0	0·0	0·0	0·0
RAIN GAUGE :—														
Action	Good.		Good.		Fair.		Good.		Good.		Good.		Good.	
Records deficient, due to stoppage of clock	0		0		0		0		0		0		0	
„ „ other causes	0		0		0		0		0		0		0	
Errors in tabulation	0		1		0		2		0		8		1	

BAROGRAPH :—							
Action	Good.	Good.	Good.	Good.	Good.	Good.	Good.
Photography	Do.	Do.	Do.	Do.	Do.	Do.	Indifferent.
Records deficient, due to stoppage of clock	0	0	0	0	0	0	0
„ „ failure of light	0	0	8 hrs.	0	3 hrs.	0	7 hrs.
„ „ other causes	0	0	0	0	0	0	†31 hrs.
No. of errors discovered—							
In entry of standard	0	7	1	2	0	0	0
„ calculating residual correction	0	4	0	5	2	0	4
„ applying residual correction	0	1	0	10	1	1	1
„ subtraction in subsidiary tables	0	0	0	0	0	0	1
„ tabulation by subsidiaries	0	0	0	0	0	0	0
„ „ irregular differences	0	0	0	0	0	0	1
Result of 40 *Remeasurements :—*							
Greatest difference	0·005	0·005	0·005	0·006	0·005	0·005	0·006
Mean difference irrespective of sign	·0029	·0018	·0028	·0024	·0022	·0030	·0034
Residual difference (— Meteorological Office)	—·0013	+·0003	+·0003	—·0017	+·0016	—·0002	+·0010
Mean monthly difference between simultaneous barograph and barometer readings	0·0017	0·0025	0·0017	0·0021	0·0024	0·0014	0·0018

THERMOGRAPH :—														
Action	Good.		Good.		Good.		Good.		Good.		Good.		Good.	
Photography	Do.		Do.		Do.		Do.		Do.		Do.		Fair.	
	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
Records deficient, due to stoppage of clock	0	0	0	0	1	1	0	0	2	2	4	4	1	1
„ „ failure of light	0	0	0	0	0	0	0	0	0	0	0	0	1	5
„ „ imperfectly moistened bulbs	—	0	—	0	—	0	—	0	—	0	—	1	—	0
„ „ partially frozen	—	2	—	0	—	0	—	0	—	7	—	0	—	0
„ „ other causes	0	0	0	0	0	0	0	0	0	0	‡30	‡30	0	0
No. of errors discovered in entry of standard	1	0	2	0	0	0	0	0	0	0	0	0	0	0
„ „ by subsidiary measurements	0	0	0	0	0	0	0	0	0	0	0	1	0	0
„ „ of subtraction in do. tables	0	0	0	3	0	0	2	0	0	4	0	1	0	2
„ „ detected under glass scale	3	1	7	3	0	0	10	9	2	3	3	4	4	0
Result of 40 *Remeasurements :—*														
Greatest difference	0·3	0·3	0·3	0·2	0·2	0·2	0·3	0·3	0·2	0·2	0·3	0·3	0·3	0·3
Mean difference irrespective of sign	·18	·10	·10	·11	·13	·07	·07	·07	·08	·09	·15	·13	·14	·10
Residual difference (— Meteorological Office)	—·18	—·08	—·07	—·03	+·11	—·06	—·00	—·03	·00	+·03	+·05	+·07	+·08	—·09
Mean monthly difference between simultaneous thermograph and thermometer readings	0·14	0·14	0·13	0·19	0·07	0·12	0·16	0·13	0·13	0·15	0·12	0·19	0·13	0·18
No. of errors in maxima and minima	0	–	5	–	0	–	4	–	2	–	2	–	4	–

* Instrument under repair.

† Owing to bad photography.

Cylinder stopped through binding rods getting out of place.

Submitted—The following abstract of accounts from April 1st, 1877, to December 31st, 1877 :

Income.	£	s.	d.	Expenditure.	£	s.	d.
Balance from year 1876–7	67	7	8	Administration :			
Vote for year 1877–8	12,000	0	0	Council	500	0	0
Weather information supplied for newspapers, &c.	284	5	9	Secretary	600	0	0
Repayments for telegrams, subscriptions for D.W. Charts, &c.	676	13	1	Special Researches and Experiments	34	19	9
Supply of data from ships' logs, &c.	7	18	0	Office Expenses :			
Sale of Instruments, &c. :				Salaries and wages	451	4	3
Mercantile marine account	33	11	9	Rent, fuel, and lighting	421	2	8
Royal Navy „	12	1	0	Furniture	3	16	1
Observatory „	7	10	0	Incidental and contingent expenses	247	10	5
Repayments of expenses charged under :				Land Meteorology :			
(1) Incidental expenses	13	7	3	Observatories and other stations	1,800	11	7
(2) Observatories, &c.	18	6	10	Discussion and reduction of observations	899	18	8
Interest on deposit account	1	17	1	Weather Telegraphy :			
Commision charged for work done for Colonies, &c.	38	2	10	Telegrams, storm warnings, and reporters	2,265	1	5
Sundries	18	14	10	Inspectors in Scotland and Ireland	63	14	2
				Preparation, issue, and discussion of Weather Reports	976	15	3
				Ocean Meteorology :			
				Supply of instruments and other expenses :			
				Royal Navy (new instruments)	134	2	5
				„ repairs and other expenses	95	1	4
				Mercantile Marine (new instruments)	314	5	0
				„ repairs and other expenses	184	4	1
				Reduction and discussion of observations, and care of instruments	1,205	13	4
					10,198	0	5
				Balance	2,981	15	8
Total	£13,179	16	1	Total	£13,179	16	1

Liabilities.	£	s.	d.	Assets.	£	s.	d.
To sundry creditors (partly estimated)	889	13	0	By cash in hand and on current account	1,025	10	11
„ council	500	0	0	„ balance in hand at Valencia	50	0	0
„ balance (as above)	2,981	15	8	„ H.M. Exchequer	2,950	0	0
				„ sundry debtors	345	17	9
Total	£4,371	8	8	Total	£4,371	8	8

The value of stock of instruments, &c. is not included in this statement.

The following cheques for December were drawn on the 24th of that month :—

For Office :

		£	s.	d.
Administration and expenses :				
R. H. Scott	Salaries and wages	66	13	4
J. S. Harding, jun.		20	16	8
J. S. Harding, sen.		*9	12	6
T. D. Bell		8	6	8
	Carried forward	£105	9	2

* Five weeks to the 29th December.

	£	s.	d.	£	s.	d.
Brought forward -	-		-	105	9	2
C. W. Jacques, rent - - - -	-		-	133	13	0
Atkinson & Co., furniture - - -	-		-	3	16	1
Bank of England account, Stationery Office -	-		-	9	1	4
Pickford & Co., carriages - - -	-		-	2	13	10
Williams and Norgate, books - - -	-		-	2	8	1
For Land Meteorology; Quarterly Allowances, &c.:						
D. Thomson, Aberdeen - - - -	-		-	*61	17	6
T. R. Robinson, Armagh - - -	40	14	0			
,, Expenses, per vouchers -	9	10	8			
				50	4	8
W. L. Fox, Falmouth - - - -	-		-	*56	2	6
R. Grant, Glasgow - - - -	-		-	*52	7	6
H. Williams, Holyhead - - - -	-		-	2	13	5
G. M. Whipple, Kew - - - -	100	0	0			
,, Expenses, per vouchers - -	8	7	8			
				108	7	8
C. Clouston, Orkney - - - -	-		-	3	3	10
G. H. Aird, Seaham - - - -	-		-	2	13	10
S. J. Perry, Stonyhurst - - - -	-		-	*49	14	3
J. E. Cullum, Valencia - - - -	14	3	4			
,, Expenses, per vouchers - -	48	16	2			
				62	19	6
G. T. Watson, Yarmouth - - -	-		-	4	0	0
P. Adie, repairing barographs - - -	-		-	1	9	6
W. Marriott, Meteorological Society's returns -	-		-	40	16	8
J. Driscoll, rent at Valencia - - -	-		-	25	0	6
R. H. Curtis -				14	3	4
C. H. Thompson				†8	0	0
E. G. Aldridge - } Computations - -	-		-	†6	5	0
J. A. Curtis -				10	16	8
H. W. Chivers -				†4	17	6
For Weather Telegraphy; Quarterly Allowances, &c.:						
Postmaster General, telegrams, October -	-		-	190	11	5
N. Hoffmeyer, synoptic charts - -	-		-	18	9	11
J. C. Stevens, Ardrossan postmaster - -	0	6	6			
,, for ,, reporter - -	0	14	9			
				1	1	3
H. Todd, Cambridge - - - -	-		-	4	11	3
J. Costello, Dover - - - -	-		-	3	8	0
J. Tilston, Holyhead - - - -	-		-	3	18	0
W. Taylor, Inverness - - - -	-		-	1	6	0
J. Fisher, Jersey - - - -	-		-	3	14	0
G. Mitchell, Kingstown - - - -	-		-	3	6	5
P. Turnbull, Leith - - - -	-		-	0	13	0
F. Gaster, London - - - -	-		-	3	5	0
J. Lowry, Moville - - - -	-		-	3	18	4
W. D. Penny, Nairn - - - -	-		-	4	4	6
M. Mackintosh ,, - - - -	-		-	0	13	0
E. J. Lowe, Notts - - - -	-		-	3	18	0
J. Lucas, Oxford - - - -	-		-	3	11	6
J. Merrifield, Plymouth - - - -	-		-	3	5	0
W. Sandford, Portishead - - -	-		-	3	18	6
J. C. Walker, St. Ann's Head - - -	-		-	2	16	0
W. Thomas, Scilly - - - -	-		-	1	7	1
W. Brand, Shetland - - - -	-		-	3	5	2
Carried forward -	-		-	£1,090	16	8

* Deduction made for stores supplied.

† Five weeks to the 29th December.

	£	s.	d.	£	s.	d.
Brought forward -	-		-	1,090	16	8
H. Isbister, Shetland - - - -	-		-	0	13	0
J. Smith, Stornoway - - - - -	-		-	4	5	6
W. Morison ,, - - - - -	-		-	1	6	0
J. Trotter, Thurso - - - - -	-		-	3	5	0
J. Macdonald ,, - - - - -	-		-	0	13	0
J. Sinclair, Wick - - - - -	-		-	3	5	7
H. Little ,, - - - - -	-		-	0	13	0
G. T. Watson, Yarmouth - - - -	-		-	4	6	10
C. Wakefield, York - - - - -	-		-	3	5	9
A. Buchan, salary - - - - -	-		-	37	10	0
F. Gaster -				15	16	8
W. L. Dallas - } Computations, &c. - - -	-		-	10	0	0
F. Brodie -				8	16	8
For Ocean Meteorology:						
P. Adie, repairing "A." barometers - -	12	14	0			
,, "B.T." barometers and repairs - -	93	17	6			
				106	11	6
Z. Scaping, Hull agent - - - -	-		-	2	0	0
J. Gill, Liverpool ,, - - - - -	-		-	13	18	9
King, Seymour, & Co., Southampton agents -	-		-	1	10	6
Street Brothers, advertisements - - -	-		-	1	2	6
G. M. Whipple, verifications - - -	6	3	0			
,, ,, - - -	15	13	6			
				21	16	6
J. H. Woodstock, packing cases, &c. - -	-		-	1	15	6
H. Toynbee -				33	6	8
R. Strachan -				20	16	8
C. Harding - } Computations, care of instruments, &c. -			-	15	0	0
T. E. Allen -				10	16	8
H. Harries -				*9	12	6
Miscellaneous:						
J. S. Harding, jun., current expenses - - -			-	200	0	0
,, ,, - - -			-	50	0	0
G. M. Whipple, commissions - - - -			-	20	0	0
Total - -			£1,693	1	5	

* Five weeks to the 29th December.

The following cheques for January were drawn:—

Administration:				
R. H. Scott, salary - - - - - -			66	13	4
Special Researches, &c.:				
Elliott Brothers, wind integrator - - - - -			15	0	0
T. Stephens & Sons ,, - - - - -			2	11	5
Office Expenses:				
J. S. Harding, jun.			27	15	6
T. D. Bell - } Salaries and wages - -			11	2	2
J. S. Harding, sen.			*8	19	8
C. Gillman, gas - - - - - -			4	5	7
Pall Mall Coal Co., coals - - - - -			5	15	0
E. Davis & Son, lamp requisites, &c. - - -			1	3	3
E. Higgs, repairs, &c. - - - - -			1	14	6
D. Nutt, books - - - - - -			1	16	6
Pickford & Co., carriages - - - -			1	19	8
Wightman & Co., printing, &c. - - - -			1	2	6
Carried forward - -			£149	19	1

* Four weeks to the 26th January.

	£	s.	d.	£	s.	d.
Brought forward -	-		-	149	19	1
Land Meteorology:						
J. E. Cullum, Valencia, salary - - - -	-		-	14	3	4
Malby & Sons, printing - - - - -	-		-	50	19	0
R. H. Curtis -				18	17	9
C. H. Thompson -				*8	10	8
J. A. Curtis - Discussion, &c. of observations	-		-	14	8	10
E. G. Aldridge -				*6	13	4
H. W. Chivers -				*5	4	0
Weather Telegraphy:						
F. Dangerfield, delivery of D.W. Chart - -	-		-	12	11	10
Postmaster General, telegrams, November -	-		-	253	7	10
Wightman & Co., printing, &c. - - - -	-		-	20	2	0
G. M. Whipple, instruction of Mr. Buchan -	-		-	2	2	0
F. Gaster -				†28	15	9
W. L. Dallas - Preparation, &c. of Weather Reports	-		-	†18	3	4
F. Brodie -				†16	2	5
P. A. Feathers, Dundee agent - - - -	-		-	1	15	6
D. McGregor & Co., Glasgow agents - -	-		-	3	17	6
Pewtress & Co., printing "Notice to Captains" -	7	5	0			
,, ,, "The Great Hurricane"	10	4	0			
				17	9	0
Capt. H. Toynbee				33	6	8
R. Strachan -				27	15	6
C. Harding - Reduction, &c. of observations and care of instruments.				20	0	0
T. E. Allen -				14	8	10
H. Harries -				*10	5	4
Miscellaneous:						
J. S. Harding, jun., current expenses - - -	-		-	100	0	0
,, ,, - - - -	-		-	60	0	0
				£908	19	6

* Four weeks to the 26th January.
† Including allowance for attendance on Sunday.

Reported—That the accounts for the past quarter were ready for audit. The Chairman and Mr. Galton were requested to audit them.

The days of meeting were fixed as follows for the next three months: February 15, March 1, 15, 29, April 12, 26.

The Council then adjourned.

116, *Victoria Street, February* 15, 1878.

PRESENT:

PROFESSOR H. J. S. SMITH IN THE CHAIR.

MR. DE LA RUE.	THE HYDROGRAPHER.
MR. GALTON.	PROFESSOR STOKES.

The Secretary was in attendance.

The Minutes of last meeting (January 25) were read and confirmed.

The Rev. W. Clement Ley attended, and explained to the Council the scheme of the first portion of his proposed edition of the Barometer Manual (Minutes, January 25). He further made application for certain additional illustrations of cloud forms, &c.

Resolved—That Mr. Ley's draft be printed and circulated with certain additions which he was requested to make to it.

Mr. Ley was further authorised to have one drawing of a cloud form made.

Submitted—The following Memorandum:—

SIR, Meteorological Office, Feb. 15, 1878.

IN accordance with the third resolution passed by the Council at their last meeting I herewith hand you two charts of four one-degree squares off the Cape, the one representing the winds and currents, the other the barometer data for July.

I have selected the largest scale used by Capt. Evans for his specimens, as it seemed most suitable.

I did not try a smaller scale, because I thought that there was good reason to show that it would not answer.

There will be rather more than half as much more data to go on these charts, when the extraction from logs is completed.

I also hand in a chart of the same data represented after our old method, with a modification of the wind arrow to show what proportion of the winds were gales.

We have also charted the weather, clouds, and sea according to our old method, and I have drawn up a few remarks deduced from the "remarks," &c., extracted from the logs.

The last two charts and remarks have been prepared to show the application of our old method to the present work.

HENRY TOYNBEE,
Marine Superintendent.

R. H. Scott, Esq., Secretary,
Meteorological Council.

Resolved—That Captain Toynbee be instructed to prepare charts, similar to those submitted by him to-day, for the month of January: the winds and currents being placed on two different charts.

Resolved—That Professor Stokes be requested to consider further a method proposed by him (Letter 2357, 1877) for deducing mean results from the data of barometrical pressure as charted.

The Secretary reported that the Committee appointed to consider the Greenwich thermograms had met on two occasions, and that certain correspondence had passed between himself and the Astronomer Royal which he submitted (Letters "received" Nos. 357 and 402, and "written" Nos. 341 and 373), together with a report drawn up by the Committee.

He was instructed to send to the Astronomer Royal the memorandum prepared with reference to the subject, and to offer to have an interview with the Astronomer Royal if he should wish it.

The Secretary reported that after repeated consultations with Mr. Galton, the following table had been prepared and published in the "Times" for the 14th inst.

AGRICULTURAL STATISTICS of the WEATHER, for the Week ending 11th February 1878.

	Districts.	Temperature.				Rainfall.		
		Mean of Max.	Mean of Min.	Mean for the Week.	No. of Degrees Fahr. above or below the Average* for the Week.	No. of Rainy Days.	Rainfall for the Week.	Amounts as compared with the Average* for the Week.
		Degrees Fahr.	Degrees Fahr.	Degrees Fahr.			Inches.	
Principal Wheat-producing Districts.	Scotland, East	47	37	42	2° above	1	0·03	Very small.
	England, North-East	42	32	37	2° below	1	0·03	„
	England, East	41	31	36	4° below	1	0·03	„
	Midland Counties	41	32	37	5° below	2	0·06	„
	England, South	41	33	37	5° below	3	0·14	¼ of average.
Principal Grazing, &c. Districts.	Scotland, West	47	38	42	2° below	1	0·02	Very small.
	England, North-West	42	33	38	4° below	2	0·02	„
	England, South-West	45	37	41	2° below	2	0·17	¼ of average.
	Ireland, North	46	38	42	1° above	2	0·04	Very small.
	Ireland, South	48	41	45	2° below	3	0·26	¼ of average.

* The data for averages of rainfall are derived from the 10 years' observations 1866–75; those for average temperature from the 13 years' observations 1857–69.

GENERAL REMARKS.

The thermometer sank below freezing point (32° F.) in shade on five days in the eastern and north-eastern parts of England; on four days in the south, on three days in the south-west and north-west, and once over the central, parts of Ireland.

Weather has been gloomy and foggy generally, with very light winds or calms.

Note.—The Stations now established in the several districts are as follow:

SCOTLAND, EAST—Nairn, Aberdeen, Glenalmond, Leith; ENGLAND, NORTH-EAST—Shields, Durham, Scarborough, York, Kelstern (Lincoln); ENGLAND, EAST—Yarmouth, Cambridge, Audley End; MIDLAND COUNTIES—Nottingham, Leicester, Oxford, Shrewsbury, Hereford; ENGLAND, SOUTH—London, Marlborough, Strathfield Turgiss, Dover, Hastings, Hurst Castle; SCOTLAND, WEST—Laudale, Glasgow, Ardrossan, Silloth; ENGLAND, NORTH-WEST—Stonyhurst, Manchester, Bidston Observatory, Holyhead; ENGLAND, SOUTH-WEST—Pembroke, Portishead, Falmouth, Plymouth; IRELAND, NORTH—Greencastle, Donaghadee, Armagh; IRELAND, SOUTH—Kingstown, Parsonstown, Roche's Point, Valencia.

He reported that the Central Press Association were prepared to receive and issue the Report, and that he proposed to offer it to the London papers generally—Approved.

He was authorised to use his discretion as to employing telegraphy if he should find it necessary for the purpose of ensuring the punctual receipts of the information. He further reported that he had made arrangements with the Meteorological Society for the receipts of returns from six of their stations, at the cost of 1*s.* a week to defray expense of copying and porterage of the six Reports from the Society's rooms to the Office. (Letter 482.)

This arrangement was approved, but the Secretary was instructed not to make any allowance to individual observers for furnishing these returns.

Submitted a specimen form of publication (Letter 420), similar to the weekly Return of the General Register Office, containing,—

Page 1.—The table given above, with a map of the United Kingdom, showing the districts referred to.

Page 2.—A detailed table showing similar information for the individual stations, as well as for those in the North of Scotland and in the Channel Islands.

Page 3.—A summary of the weather in Western Europe for the week.

Resolved—That the Report be published, but at first only the two first pages. The price to be 1*d.* per copy, and subscription 7*s.* 6*d.* per annum in advance. The Secretary was instructed to make arrangements for the publication.

SUBMITTED—The following STATEMENT respecting the RECORDS for November 1877, received from the SELF-RECORDING OBSERVATORIES, which have been examined at the METEOROLOGICAL OFFICE (see Minutes 21st December 1868).

	Aberdeen.		Armagh.		Falmouth.		Glasgow.		Kew.		Stonyhurst.		Valencia.	
ANEMOGRAPH:—	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Good.	Direction. Good.	Velocity. Good.	Direction. Fair.	Velocity. Good.	Direction. Good.	Velocity. Good.
Action														
Records deficient, due to stoppage of clock	0	0	0	0	0	0	0	0	0	0	0	0	0	0
„ „ other causes	0	0	0	0	0	0	0	0	‡1 hr.	‡1 hr.	0	0	0	0
Orientation verified	30th	—	30th	—	13th	—	8th	—	—	—	23rd	—	17th	—
No. of errors discovered by subsidiaries	0	0	0	2	0	1	0	1	0	1	0	0	0	8
„ „ irregular differences	0	1	0	0	0	2	0	2	0	2	0	9	1	0
Result of 40 *Remeasurements*:—														
Greatest difference	0	1·0	1·0	1·0	0·0	1·0	1·0	2·0	1·0	1·0	1·0	1·0	1·0	1·0
Mean difference irrespective of sign	0	0·5	0·1	0·6	0·0	0·5	0·1	0·4	0·0	0·2	0·1	0·6	0·1	0·5
Residual difference (— Meteorological Office)	0	−0·1	−0·1	+0·1	0·0	0·0	0·0	−0·1	0·0	0·0	0·0	0·0	+0·1	−0·1
RAIN GAUGE:—														
Action	Good.		Good.		Good.		Good.		Good.		Good.		Fair.	
Records deficient, due to stoppage of clock	0		0		0		0		0		0		0	
„ „ other causes	0		*14 hrs.		0		†15 hrs.		†12 hrs.		0		0	
Errors in tabulation	1		3		0		1		0		11		18	

BAROGRAPH :—

Action	Good.	Good.	Good.	Good.	Good.	Good.	Good.
Photography	Do.	Do.	Do.	Do.	Do.	Do.	Fair.
Records deficient, due to stoppage of clock	0 *	0	1 hr.	0	0	0	0
„ „ failure of light	0	0	0	0	0	4 hrs.	1 hr.
„ „ other causes	0	0	0	0	0	0	0
No. of errors discovered—							
In entry of standard	0	0	0	2	3	9	0
„ calculating residual correction	0	1	0	1	1	2	0
„ applying residual correction	0	0	0	5	0	6	1
„ subtraction in subsidiary tables	0	0	0	0	0	0	1
„ tabulation by subsidiaries	0	0	0	0	0	0	0
„ „ irregular differences	1	3	0	5	1	3	1
Result of 40 *Remeasurements :—*							
Greatest difference	0·005	0·006	0·005	0·005	0·005	0·006	0·005
Mean difference irrespective of sign	0·0023	0·0034	0·0022	0·0030	0·0023	·00033	0·0026
Residual difference (— Meteorological Office)	+0·0002	−0·0009	+0·0013	+0·0006	−0·0002	−0·0008	−0·0020
Mean monthly difference between simultaneous barograph and barometer readings	·00019	0·0030	0·0024	0·0020	0·0030	0·0015	0·0017

THERMOGRAPH :—

Action	Good.		Good.		Good.		Good.		Good.		Good.		Good.	
Photography	Do.		Do.		Do.		Do.		Do.		Do.		Fair.	
	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
Records deficient, due to stoppage of clock	0	0	§4 hrs.	§4 hrs.	0	0	0	0	0	0	1 hr.	1 hr.	3 hrs.	3 hrs.
„ „ failure of light	0	6hrs.	0	0	0	0	0	0	0	0	0	0	0	0
„ „ imperfectly moistened bulbs	—	0	—	0	—	3 hrs.	—	0	—	0	—	0	—	0
„ „ partially frozen	—	10 hrs.	—	0	—	0	—	0	—	5 hrs.	—	0	—	0
„ „ other causes	0	0	‖1 hr.	‖1 hr.	0	0	0	0	0	0	0	0	0	¶1 hr.
No. of errors discovered in entry of standard	0	0	0	1	0	0	0	0	0	0	0	1	0	0
„ „ by subsidiary measurements	0	0	0	1	0	0	1	0	0	0	0	0	0	0
„ „ of subtraction in do. tables	0	0	1	2	0	0	2	1	2	1	5	1	2	2
„ „ detected under glass scale	3	1	2	1	0	0	2	1	1	1	3	2	1	0
Result of 40 *Remeasurements :—*														
Greatest difference	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2	0·2
Mean difference irrespective of sign	0·08	0·05	0·11	0·05	0·07	0·11	0·06	0·08	0·06	0·09	0·11	0·11	0·09	0·10
Residual difference (— Meteorological Office)	−0·07	+0·04	+0·03	+0·02	+0·05	−0·02	−0·02	−0·07	−0·01	+0·01	+0·10	+0·05	+0·03	−0·05
Mean monthly difference between simultaneous thermograph and thermometer readings	0·10	0·10	0·12	0·13	0·08	0·10	0·16	0·13	0·10	0·13	0·14	0·15	0·21	0·15
No. of errors in maxima and minima	1	—	2	—	3	—	11	—	0	—	6	—	1	—

* Clock not started. † Tube choked. ‡ Clamp-pin broken. § Clock stopped, out of order. ‖ Light on binding rods. ¶ Blemish on the curve.

Read—A letter from Captain Toynbee, stating that six logs had been received since last meeting, three of them being "excellent," viz. :

Observer.	Ship.	Period.	Voyage.	Last Mention on Minutes.
W. Barron -	S.S. "Sultan" -	Sept. 6, 1877—Jan. 7, 1878.	9 voyages. Hull to Hamburg.	(Council) p. 14.
C. W. Pearson -	S.S. "Strathleven."	Ap. 26, 1877—Jan. 22, 1878.	Liverpool to Calcutta and home.	(Committee) p. 31.
A. Simpson -	Sch. "Traveller"	Ap. 3—Nov. 9, 1877	Peterhead to Ivigtut, Philadelphia, and home.	1876, p. 135.

Mr. Scott was instructed to convey the marked thanks of the Council to the above gentlemen.

Reported—That the cash accounts for the quarter ended 31st December 1877 were audited by the Chairman and Mr. Galton on the 2nd instant, and had been sent to the Treasury for the Audit Office. The receipts for the quarter, exclusive of a balance of 1,252*l.* 19*s.* on the 1st October, amount to 3,404*l.* 15*s.* 2*d.* The payments amount to 3,582*l.* 3*s.* 3*d.*, leaving a balance of 1,075*l.* 10*s.* 11*d.* on the 1st January 1878, in hand and at the bank.

Reported—That the Daily Weather Charts had been supplied to the "New York Herald."

Reported—That the following new instruments, to replenish stock, had been ordered since the meeting of 25th January, at the following estimated cost (including verifications).

	£	*s.*	*d.*
"A." account :			
192 thermometers - - - - -	67	4	0
"B.T." account :			
1 aneroid - - - - - -	2	7	6

Resolved—That the hour of meeting be 2 o'clock in future instead of 3.

The Council then adjourned.

116, *Victoria Street, March* 1, 1878.

PRESENT :

PROFESSOR H. J. S. SMITH IN THE CHAIR.

MR. DE LA RUE. | THE HYDROGRAPHER.
MR. GALTON. | PROFESSOR STOKES.

The Secretary was in attendance.

The Minutes of last meeting (Feb. 15) were read and confirmed.

Read—The following letter with certain memoranda :

Meteorological Office,
March 1, 1878

SIR

WITH this I beg to hand you the three Charts for January, which have been prepared according to the request of the Council at their last meeting.

Yours, &c.
(Signed) HENRY TOYNBEE.
Marine Superintendent.

R. H. Scott, Esq., F.R.S.

The Hydrographer having expressed his willingness to prepare some remarks on the January and July Charts for the two-degree square $\{^{50°51}_{60°61}\}$ of Square 441—

Resolved—That the Hydrographer be requested to prepare such remarks, and also a memorandum with reference to the future course of the work with regard to the Cape squares.

Resolved—That Capt. Toynbee's Memoranda—

1. On the July Charts,
2. On the method of discussing the observations off the Cape of Good Hope,

be printed and circulated.

The Secretary reported that he had had further correspondence with the Astronomer Royal (letters "written" 425, 463, and "received" 440 and 448) and he submitted the following report, which was ordered to be printed on the Minutes:

GENTLEMEN, March 1, 1878.

I HAVE to report that in accordance with your instructions, I made arrangements with the Astronomer Royal for a personal interview, and accordingly went to Greenwich on Tuesday last the 26th ult.

Sir G. Airy pointed out to me several instances of sudden changes in the indications of his thermograms, which he considers satisfactory proof of the sensitiveness of his thermograph, although he fully admitted that the records from all of our observatories exhibited certain rapid oscillations of temperature, especially at mid-day, which are not perceptible in the Greenwich photographic records.

I found by the examination of the records for the past 20 years, which are now in process of publication, that discrepancies between the curve readings and eye observations existed in the measurements made at Greenwich, and were, speaking generally, of the same character as those noticed in this Office and which have formed the subject of the Memoranda by Mr. R. Curtis submitted to the Committee appointed to consider this subject.

The Astronomer Royal applies a mean monthly correction to the curve readings derived from the monthly differences between the curve and standard readings, and he expressed to me his opinion that it would hardly be practicable to bring the individual Greenwich curves into the same degree of accordance with their own standard readings as has been hitherto attained at our observatories.

The reason for this he was disposed to find in the fact that the ordinary thermometers were too sensitive, being ordinary pea bulb instruments in a Glaisher screen, and thus affected by radiation, while the thermograph thermometers have cylindrical bulbs 8 inches in length and nearly 0·5 inch in diameter.

The Greenwich thermograph is placed in a free-standing shed; the bulbs are not protected in any way except from sun and rain.

I may say that at our observatories the thermograph thermometers and the standard thermometers are in the same screen; they are of the same size, 3·5 inches in length and 0·37 inch in external diameter, and are consequently affected by temperature in the same way.

(Signed) ROBERT H. SCOTT.

Resolved—That the Greenwich curves be engraved without applying the corrections which might be derivable from the standard readings given on the curves.

The Secretary reported—That the scale of the electrograms (Minutes, p. 30) had been determined by Mr. Whipple, at Mr. De La Rue's Laboratory, and he submitted specimen curves which had been engraved in the Office at the request of the Kew Committee, for the purpose of illustration of a lecture to be delivered at the College de France, by M. Mascart.

The Secretary was authorised to make a communication on the subject to the Royal Society.

Read—A letter from Capt. Toynbee stating that 14 logs had been received since last meeting, of which the following three were "excellent":

Observer.	Ship.	Period.	Voyage.	Last mention on Minutes.
Capt. Jas. Gordon -	s.s. "City of Oxford."	Nov. 11, 1877—Feb. 12, 1878.	Liverpool to Calcutta and back viâ Suez.	1876, p. 108.
Geo. Innes - -	"Agnes Rose"	June 12, 1877—Feb. 18, 1878.	London to Sydney and back.	(Committee) 1877, p. 31.
W. Symington -	s.s. "Hankow"	Sept. 23, 1877—Feb. 12, 1878.	London to Melbourne and Sydney and home viâ Suez.	(Council) 1877, p. 17.

The Secretary was instructed to convey the marked thanks of the Council to the above gentlemen.

The Secretary reported—That in the course of his duties as Secretary to the Permanent Committee of the Vienna Congress, his acceptance of which position had been formally approved by the Meteorological Committee (Minutes, 1874, p. 67; 1876, p. 83), he had been requested to prepare certain reports as detailed in the programme for the International Congress originally proposed to be held at Rome in September, 1877. This programme had been duly submitted to the Meteorological Committee (Minutes, 1876, p. 132).

He submitted the reports in question, being on the subjects of the present position of Maritime Meteorology and of Weather Telegraphy, and he stated that Prof. J. D. Everett had prepared a report on Atmospheric Electricity.

As these reports appeared to contain a great amount of information likely to be of service to the Council, it was resolved that they should be printed.

The Secretary submitted specimens of pages 1 and 2 of the Weekly Weather Report, which were approved with slight alterations.

He reported—That the arrangements for the matter for pp. 3 and 4 were not yet complete, and that he was in communication with the Stationery Office as to the mode of publication of the Report.

Submitted—The following Memorandum:

I HEREWITH beg to submit to the Council, in accordance with the Minute of December 19th 1877, a specimen of the manner in which I propose to deal with the data for Arctic stations, showing the means and extremes of the meteorological elements or subjects of observation.

(Signed) R. STRACHAN,
March 1, 1878.

Mr. Strachan's specimen was ordered to be printed.

Reported—That the Daily Weather Charts had been supplied to Capt. De La Haye of the French Balloon Corps, Meudon, in exchange for observations.

Reported—That the following new instruments, to replenish stock, had been ordered since the meeting of 15th February, at the following estimated cost (including verifications).

" B.T." Account:	
100 hydrometers	£22 10 0

Reported—That the following cheques for February were drawn on the 25th of that month:—

	£	s.	d.
Administration:			
R. H. Scott, salary	66	13	4
Office Expenses:			
J. S. Harding, junior } Salaries and wages	27	15	6
T. D. Bell } Salaries and wages	11	2	2
J. S. Harding, senior } Salaries and wages	*8	19	8
Atkinson & Co., Furniture	2	2	0
London and North-Western Railway Co., Carriages	1	14	2
H. Sotheran & Co., Books	4	15	0
J. Wheldon, ,,	3	13	0
Land Meteorology:			
J. E. Cullum, Valencia, Salary	14	3	4
Hopkin and Williams, Chemicals	4	4	4
R. Strachan, Meteorological Registers	4	7	6
R. H. Curtis } Discussions, &c. of Observations	18	17	9
C. H. Thompson } Discussions, &c. of Observations	*8	10	8
J. A. Curtis } Discussions, &c. of Observations	14	8	10
T. E. Allen } Discussions, &c. of Observations	14	8	10
E. G. Aldridge } Discussions, &c. of Observations	*6	13	4
H. W. Chivers } Discussions, &c. of Observations	*5	4	0
Carried forward	217	13	5

* Four weeks to the 23rd February.

	£	s.	d.
Brought forward - - -	217	13	5
Weather Telegraphy:			
Postmaster General, Telegrams, December - - -	194	4	1
„ „ Wire at Valencia - - - -	22	0	0
F. Gaster - } Preparation, &c. of Weather Reports -	†28	15	9
W. L. Dallas - } Preparation, &c. of Weather Reports -	†18	3	4
F. Brodie - } Preparation, &c. of Weather Reports -	†14	14	5
Ocean Meteorology:			
Bank of England, for Accounts of Navy - - -	0	17	4
Lejeune and Perken for M. Salleron - - - -	3	7	6
E. Price Edwards, Article in "Nautical Magazine" - -	17	10	0
H. Toynbee } Reduction, &c. of Observations and care of Instruments.	33	6	8
R. Strachan } Reduction, &c. of Observations and care of Instruments.	27	15	6
C. Harding } Reduction, &c. of Observations and care of Instruments.	20	0	0
H. Harries } Reduction, &c. of Observations and care of Instruments.	*10	5	4
Miscellaneous:			
G. M. Whipple, Commissions - - - - -	19	9	6
J. S. Harding, junior, Current Expenses - - -	100	0	0
„ „ „ - - -	60	0	0
	£788	2	10

* Four weeks to the 23rd February.
† Including allowance for attendance on Sundays.

The Council then adjourned.

116, *Victoria Street, March* 15, 1878.

PRESENT:

PROFESSOR H. J. S. SMITH IN THE CHAIR.

MR. DE LA RUE.	THE HYDROGRAPHER.
MR. GALTON.	PROFESSOR STOKES.

The Secretary was in attendance.

The Minutes of last meeting (March 1) were read and confirmed.

The Chairman brought under the notice of the Council the following paragraph in the letter from the Treasury to the Royal Society, dated May 24, 1877 (Parliamentary Paper, No. 351, Session 1877) :—

MY Lords lay stress on retaining a marked distinction between this Council and a Government Office, and they would prefer, therefore, that its reports should be made to the Council of the Royal Society, with the understanding that those reports should be annual, and should be made for years ending, say, in August, up to which date the members of the Council would be likely to remain in London. The report might thus be in print and in the hands of the Council of the Royal Society before November, and might be communicated to my Lords, with the observations of the Council before the middle of December, so as to be considered by my Lords in settling the Estimates for the coming year. The reports and the remarks of the Council of the Royal Society on them would be laid before Parliament.

After some discussion it was resolved—That the Annual Report should refer to the financial year, ending on the last day of March, in case it should be found that the Treasury have no objection to this proposal.

The Secretary was instructed to endeavour to ascertain the views of the Treasury on this subject, pointing out the reasons for the conclusion at which the Council have arrived.

It was further resolved—That the Chairman be requested to prepare a first draft of Parts I. and II. of the Report.

Part I. as usual to refer to the ordinary work of the Office during the period to which the Report refers, in the three branches of Ocean Meteorology, Weather Telegraphy, and Land Meteorology of the British Islands.

Part II. to refer to the various special researches conducted during the year, such as the comparison of the automatic records at Kew and Greenwich.

Part III. to refer to the work which the Council propose to undertake in the coming year.

SUBMITTED—The following STATEMENT respecting the RECORDS for December 1877, received from the SELF-RECORDING OBSERVATORIES, which have been examined at the METEOROLOGICAL OFFICE (see Minutes, 21st December 1868).

	Aberdeen.		Armagh.		Falmouth.		Glasgow.		Kew.		Stonyhurst.		Valencia.	
ANEMOGRAPH:—	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.	Direction.	Velocity.
Action	Good.	Good.	Indifferent.	Fair.	Good.	Good.	Fair.	Indifferent.	Good.	Good.	Fair.	Fair.	Good.	Good.
Records deficient, due to stoppage of clock	0	0	25 hrs.	26 hrs.	0	0	0	0	0	0	0	0	0	0
,, ,, other causes	0	0	*1 hr.	0	†2 hrs.	†2 hrs.	0	0	0	0	‡1 hr.	1 hr.	§8 hrs.	0
Orientation verified	22nd	—	18th	—	13th	—	1st	—	4th	—	10th	—	3rd	—
No. of errors discovered by subsidiaries	0	0	0	0	0	0	0	4	0	1	0	1	0	7
,, ,, irregular differences	0	0	0	8	0	0	0	1	0	0	2	0	0	0
Result of 40 *Remeasurements*:—														
Greatest difference	1·0	1·0	1·0	1·0	0·0	1·0	0·0	1·0	0·0	1·0	2·0	2·0	0·0	2·0
Mean difference irrespective of sign	0·0	0·5	0·1	0·4	0·0	0·5	0·0	0·4	0·0	0·6	0·2	0·5	0·0	0·5
Residual difference (— Meteorological Office)	0·0	0·0	−0·1	−0·1	0·0	−0·1	0·0	+0·1	0·0	+0·2	−0·1	+0·2	0·0	0·0
RAIN GAUGE:—														
Action	Fair.		Fair.		Fair.		Good.		Good.		Good.		Fair.	
Records deficient, due to stoppage of clock	0		0		0		0		0		0		0	
,, ,, other causes	0		0		0		0		0		0		0	
Errors in tabulation	0		2		0		2		2		1		0	

BAROGRAPH :—

Action	Good.	**Good.	Good.	Good.	Good.	Good.	Good.
Photography	Do.	Do.	Do.	Do.	Do.	Do.	Indifferent.
Records deficient, due to stoppage of clock	0	‖7 hrs.	32 hrs.	0	0	0	0
„ „ failure of light	0	0	†† 1 hr.	0	0	0	3 hrs.
„ „ other causes	0	**1 hr.	0	0	0	0	‡‡22 hrs.
No. of errors discovered—							
In entry of standard	0	0	2	3	6	5	0
„ calculating residual correction	0	2	0	3	4	1	0
„ applying residual correction	0	3	0	10	4	2	1
„ subtraction in subsidiary tables	0	0	0	0	1	2	0
„ tabulation by subsidiaries	0	3	0	1	0	0	0
„ „ irregular differences	0	1	0	1	0	6	4
Result of 40 *Remeasurements :—*							
Greatest difference	0·004	0·006	0·005	0·006	0·006	0·006	0·006
Mean difference irrespective of sign	0·0019	0·0030	0·0018	0·0021	0·0014	0·0023	0·0025
Residual difference (—Meteorological Office)	−0·0006	+0·0011	0·0000	+0·0002	−0·0001	−0·0003	+0·0010
Mean monthly difference between simultaneous barograph and barometer readings	0·0022	0·0029	0·0021	0·0023	0·0018	0·0016	0·0016

THERMOGRAPH :—

Action	Good.		Good.		Good.		Good.		Good.		Good.		Good.	
Photography	Do.		Fair		Do.		Do.		Do.		Do.		Do.	
	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.	Dry.	Wet.
Records deficient, due to stoppage of clock	0	0	0	0	0	0	0	0	3 hrs.	3 hrs.	0	0	0	0
„ „ failure of light	0	0	0	0	0	0	0	0	0	0	0	0	0	1 hr.
„ „ imperfectly moistened bulbs	—	0	—	0	—	4 hrs.	—	0	—	4 hrs.	—	0	—	0
„ „ partially frozen bulbs	—	9 hrs.	—	15 hrs.	—	0	—	11 hrs.	—	16 hrs.	—	16 hrs.	—	0
„ „ other causes	0	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of errors discovered in entry of standard	0	0	1	3	0	0	0	0	0	2	0	1	0	0
„ „ by subsidiary measurements	0	0	0	0	0	0	0	0	0	0	0	0	0	0
„ „ of subtraction in do. tables	0	0	0	0	0	0	0	0	1	0	0	3	1	1
„ „ detected under glass scale	0	0	4	0	2	0	3	1	0	8	1	3	0	0
Result of 40 *Remeasurements :—*														
Greatest difference	0·2	0·2	0·2	0·2	0·3	0·3	0·2	0·2	0·3	0·2	0·3	0·3	0·3	0·3
Mean difference irrespective of sign	0·09	0·07	0·10	0·08	0·10	0·13	0·09	0·08	0·14	0·08	0·09	0·11	0·13	0·10
Residual difference (—Meteorological Office)	−0·06	+0·02	−0·04	−0·06	+0·07	−0·12	0·00	−0·03	−0·12	−0·02	+0·08	+0·09	+0·10	−0·06
Mean monthly difference between simultaneous thermograph and thermometer readings	0·11	0·13	0·15	0·13	0·08	0·14	0·18	0·14	0·10	0·14	0·14	0·16	0·12	0·20
No. of errors in maxima and minima	1	–	1	–	11	–	1	–	0	–	7	–	1	–

* Verifying orientation. † Pencils not lowered. ‡ Pencils under repair. § Trace invisible. ‖ Stopped by light-shutter.
** Temperature barometer broken (the curves were without proper temperature correction for 10 days). †† Light intercepted by binding rods. ‡‡ Owing to defective photography.

The Secretary reported that the full estimate of 14,500*l.* forwarded to the Treasury (Minutes, p. 59), had been inserted in the Civil Service Estimates just issued.

The Chairman stated that he had received information to the effect that General Strachey would probably be detained in India for a year longer.

Resolved—That the Chairman do write to the President of the Royal Society stating that as General Strachey is likely to be absent for a year the Council would wish that, if possible, an *ad interim* appointment should be made, as they are very anxious that the services of General Strachey should be retained for the Meteorological Office.

The Secretary reported that the Weekly Weather Report was now inserted regularly in the "Times," "Daily News," "Mark Lane Express," and "Gardener's Chronicle."

He further stated that he had written to the Stationery Office to request that if possible the sheet might be published by Messrs. Eyre and Spottiswoode.

Approved.

The consideration of the proposed establishment of an observing station in Norfolk Island was resumed (Minutes, p. 19), and it was resolved—

That a communication be addressed to the Governor of New South Wales, stating that the Council would be greatly obliged if he would assist them in establishing a Meteorological Station in Norfolk Island, the Council agreeing to supply the instruments and to pay 5*l.* a year to the observer as suggested (Letter ~~1969~~, 1877).

Read—A letter from Captain Toynbee, stating that since last meeting six logs had come in, two of them being "excellent," as follows :—

Name.	Ship.	Period.	Voyage.	Last Mention on Minutes.
Capt. R. H. Napier, R.N. (Log kept by Lieut. A. Carpenter.)	H.M.S. "Nassau"	Sept. 1—Dec. 31, 1877.	Surveying in China Seas	(Council) p. 55.
Capt. W. Waring -	S.S. "Atalanta"	July 8, 1877—Feb. 24, 1878.	Liverpool to India and back, *viâ* Suez.	(Committee) 1877, p. 41.

The Secretary was instructed to convey the marked thanks of the Council to these gentlemen.

Submitted—Letter 496, from the Board of Trade, enclosing copies of a circular describing the new system of Storm Signals introduced by the American Government.

Reported—That a cheque had been drawn on the 12th inst. for 9*l.* 7*s.* 6*d.*, being the Income Tax on the amount due for the Council fees.

The Council then adjourned.

116, *Victoria Street, March* 29, 1878.

PRESENT:

PROFESSOR H. J. S. SMITH IN THE CHAIR.

MR. DE LA RUE. | THE HYDROGRAPHER.
PROFESSOR STOKES.

The Secretary was in attendance.

The Minutes of last meeting (March 15) were read and confirmed.

The Secretary reported that in pursuance of the instructions received at last meeting, he had called on Mr. Lingen at the Treasury on the 16th instant, and had ascertained that no objection would be raised by that Department to the proposed change of date for the Annual Report, provided that the Royal Society agreed to such change. He had consequently, by the Chairman's directions, written to the Secretary of the Royal Society as follows :—

Letter 642.

SIR, Meteorological Office, London, March 20, 1878.

IN a letter from the Treasury, addressed to the President of the Royal Society, and dated May 24, 1877, it was suggested that the Report of the Meteorological Council "should be made to "the Council of the Royal Society, with the understanding that those reports should be annual, "and should be made for years ending, say in August, up to which date the members of the Council "would be likely to remain in London. The report might thus be in print and in the hands of "the Council of the Royal Society before November, and might be communicated to my Lords, "with the observations of the Council, before the middle of December, so as to be considered by "my Lords in settling the Estimates for the coming year. The reports and the remarks of the "Council of the Royal Society on them would be laid before Parliament."

I am directed to inform you that, in the opinion of the Meteorological Council, it would be more convenient for the dispatch of their own business that the annual Report should be made, not for a year ending in August, but for the financial year ending on the 31st March.

The Meteorological Council also think that this course might possibly be more convenient to the Royal Society, as the Report (if made for a year ending in March) might be laid before the President and Council of the Royal Society in June, instead of November. The earlier date would seem preferable, not only because the time of the Council of the Royal Society is much occupied with other business in November, but also because its composition is changed at the end of that month.

Under instructions from the Meteorological Council, I have ascertained from the Treasury that there would be no objection on the part of that Office to the proposed change, provided it were acceptable to the Royal Society.

I have, therefore, to request you to lay this communication before the President and Council of the Royal Society, and to inform me of their wishes on this subject.

I have, &c.
(Signed) ROBERT H. SCOTT,
Secretary.

The Secretary of the Royal Society.

Read—The following letter :—

M. 3798.
M.O. 601.

SIR, Board of Trade, March 15, 1878.

I AM directed by the Board of Trade to state that the Lords Commissioners of the Treasury have suggested whether the yearly estimate of the expenses of the Meteorological Office might not be forwarded direct to the Treasury, instead of passing through this Department.

The Board of Trade see no objection to the proposed course, and they will, therefore, be glad if the Council will in future act in accordance with this suggestion.

I am, &c.
(Signed) THOMAS GRAY.

The Secretary of the Meteorological Council.

The Secretary was instructed to express to the Board of Trade the readiness of the Council to comply with the foregoing instructions. (Letter 703.)

The Chairman reported that as directed at last meeting he had written to the President of the Royal Society with reference to the prolonged absence of General Strachey from the Council meetings.

Submitted—The following report by Mr. Strachan (Minutes, pp. 50, 72) :—

REPORT on the proposed SCOPE of the INVESTIGATION into ARCTIC METEOROLOGY, &c.

The data hitherto collected for the discussion of the meteorology of the Arctic regions, exclusive of the serial observations made at the station referred to in my Memorandum dated 1877, December 1st, and of the observations already discussed for Fort York, Fork Confidence, Friedrikshaab and Julianshaab, which discussions have been examined by the Chairman, have been derived from the following sources :—

1st. Registers kept with Meteorological Office instruments duly verified :—

Document.	Ship.	Captain.	Dates.
969	Discovery Yacht "Fox." *	F. L. McClintock	1857, July 15 to 1858, Sept. 1 ; 1859, July 15 to Sept 8.
1265	H.M.S. "Bulldog"	„	1860, July 23 to Aug. 17 ; Sept. 29 to Oct. 3.
1280	Yacht "Fox" -	Allen Young -	1860, Sept. 22 to Oct. 20.
2615	"Perseverance" -	C. Davidson -	1869, May 9 to 1870 Sept. 14.
2607	"Camperdown" -	W. Bruce -	1870, June 8 to Nov. 8.
2614	"Kate" - -	T. Leportier -	1869, April to 1870 Sept.
2656	"Sir Colin Campbell"	A. Murray -	1869, May 5 to Aug. 10.
2785	"Erik" - -	J. B. Walker -	1871, May 27 to Sept. 1.
2872	"Traveller" -	A. Simpson -	1871, April 22 to May 7 ; July 23 to Aug. 16 to 31.
3046	„ -	„ -	1872, April 28 to May 26 ; July 23 to Aug. 14.
3053	"Erik" - -	J. B. Walker -	1872, May 17 to Sept. 5.
3278	"Traveller" -	A. Simpson -	1873, April 11 to May 1 ; Aug. 16 to 28.
3488	„ -	„ -	1874, May 26 to July 9 ; Sept. 16 to Oct. 2.
3423	"Perseverance" -	A. Murray -	1873, Aug. 20 to 1874, July 29.
3669	"Traveller" -	A. Simpson -	1875, April 22 to May 23 ; July 29 to Aug. 10.
3702	Discovery Yacht "Pandora."	A. Young -	1875, July 29 to Sept. 20.
3717	H.M.S. "Valorous"	L. F. Jones -	1875, July and August.
3865	"Perseverance" -	A. Murray -	1875, Aug. 20 to 1876, July 13.
3913	"Traveller" -	Alex. Simpson -	1876, April 18 to May 16 ; July 13 to 25.
3925	Discovery Yacht "Pandora."	A. Young -	1876, June 27 to Oct. 8.
4120	"Xanthus" -	James Davidson	1876, July 13 to Sept. 24.
4184	"Catherine" -	Alex. Smith -	1877, April 17 to May 10 ; July 3 to 20.
4185	"Traveller" -	Alex. Simpson -	1877, April 17 to May 5 ; June 25 to July 14.

2nd. Registers kept on board H.M. ships with instruments specially prepared, but corrections not altogether satisfactorily known :—

Document.	Ship.	Captain.	Dates.
614	"Assistance"† -	Sir E. Belcher -	1852, May 21 to Aug. 31.
2290	"Cove" - -	J. C. Ross -	1836, May 16 to to July 21.
2291	"Victory"‡ -	John Ross -	1829, June 18 to Aug. 31.
2286	"Isabella" -	„ -	1818, May 28 to Oct. 4.
2287	"Alexander" -	E. W. Parry -	„ „ „
3631	"Resolute" -	H. T. Austin -	1851, May 6 to Aug. 31.
154	"Phœnix" -	E. A. Inglefield	1853, June 20 to Sept. 20.
Log	"Phœnix" -	„ -	1854, June 1 to Sept. 15.
2435	"Prince Albert"§	—	1846, July 12 to 27 ; Oct. 6 to 15.

3rd. Registers kept on board whalers, useful mainly for winds, weather, and state of the sea :—

Document.	Ship.	Captain.	Dates.
962	"Æolus" -	John Hibbs -	1859, Aug. 13 to 14.
2143	"Active" -	— Gray -	1862, May 8 to Oct. 26.
3289	"Isabella" -	— Humphrey -	1834, May 10 to Oct. 13.
3582	"Swan" - -	S. Dring -	1836, May 9 to 1837, June 8.
4195	"Perseverance" -	A. Simpson -	1865, Aug. 23 to 25 ; 1866, April 25 to 27 ; 1867, April 26 to 31.
„	"Traveller" -	„ -	1861, April 24 to May 18 ; Aug. 8 to 26.
„	„ -	„ -	1869, April 30 to May 14 ; July 28 to August 8.

The whole of the above data have been corrected as far as possible and grouped according to the

* Abstract published by Admiral FitzRoy, Meteorological Paper No. IV. ; also discussed by Schott (Smithsonian Contribution, No. 146).

† Abstract published in "The Last of the Arctic Voyages," 2 vols, 8vo., Lovell Reeve, London, 1855.

‡ Private expedition commanded by Sir John Ross and other naval officers, abridged register printed in "Appendix to Narrative."

§ Hudson's Bay Company's ship, but kept by a naval lieutenant, J. S. L. Moore, a passenger.

plan adopted in discussing the observations for "Contribution to the Meteorology of the Antarctic Regions," O. 18, namely, on monthly sheets for spaces of $2\frac{1}{2}°$ latitude by 5° longitude, for the region northward of 60° N., and between the meridians of Cape Farewell and Melville Island or 45° to 120° W. longitude.

I propose to add to this collection from Admiralty logs and also from logs of whalers which have been lent to the Office, whilst the discussion of the observations made at the stations is being completed.

I would respectfully suggest that the discussions already completed for Fort York, Fort Confidence, Friedrikshaab and Julianshaab be published under the title "Contributions to Arctic Meteorology, Part I." The discussions now in progress for Repulse Bay, Hudson's Straits, Griffith Island, Assistance Harbour, Disaster Bay, Port Kennedy, and Felix Harbour, would appropriately form Part II. The discussion of the sea data, which is mainly for the season in which navigation is possible, might form Part III.

I have endeavoured to perform the work with thoroughness, although carrying out the reductions only as far as appears absolutely necessary; and I hope that I may continue it, in the confidence of the Council that I shall do it honestly and diligently. During the past three months the work has occupied me at home, during January 83 hours, February 75, March 80. In addition to this I have had copying done privately, occupying in January 55 hours, March 18. This takes no account of time spent in reading Arctic literature, some results of which will be brought to bear upon the discussions with the view of giving some popular interest to the subject. To accomplish so much, I have had to refuse all offers of private work, among others the computation of results from Mr. Stanley's observations in Africa.

I have received no assistance since the close of 1877 from any of the Office staff, but I now request the Council to grant a sum, say from the Research Fund, to pay for some assistance at extra hours, the terms to be sanctioned by Mr. Scott, and the accounts checked by me, or otherwise as the Council may be pleased to decide.

I am, &c.
(Signed) R. STRACHAN.

The following is the Specimen of the proposed method of dealing with the information submitted by Mr. Strachan (Minutes p. 72.):—

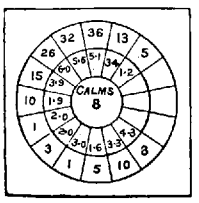
RESULTS of METEOROLOGICAL OBSERVATIONS made on Board the Searching Yacht "Fox," February 1858, while beset and drifting with the pack, between lat. 72° 30′ N., long. 61° 10′ W., and lat. 69° 50′ N., long. 59° 44′ W.

Hour.	Barometer.	Temperature.	Wind component sums.				Weather Notations.							Mean.
			N.	S.	E.	W.	b	c	o	m	f	s	q	Ozone.
4	29·627	−16°·4	104·2	11·6	11·1	50·0	11	12	5	11	–	2	–	–
8	·620	−15·1	92·4	11·6	10·0	42·6	11	12	5	7	–	3	–	8·6
Noon	·655	−14·4	78·9	10·0	4·7	38·2	13	10	5	5	–	1	1	–
4	·665	−14·8	80·1	5·4	7·6	39·4	11	10	7	8	–	5	–	–
8	·665	−15·2	82·1	8·3	4·7	45·3	8	16	4	12	–	3	–	8·3
Midnt.	·643	−16·1	93·2	9·8	8·8	43·6	9	14	5	13	–	3	–	–
Means	·646	−15·3	–	–	–	–	–	–	–	–	–	–	–	8·5

EXTREMES of PRESSURE and TEMPERATURE, with corresponding Wind and Weather.

—	Date.		Barometer.	Temperature.	Wind.	Weather.
	d.	h.				
Maximum pressure -	13	4	30·300	− 8·0	N.N.W. 3	bc
Minimum „ -	17	20	29·006	− 5·0	N. 6	bc
Maximum temperatue -	28	0	29·962	+11·0	S.S.E. 4	c
Minimum „ -	8	0	29·809	−41·0	N. 2	bv
Monthly range - -	–		1·294	52·0	–	–

Wind force 8, and above, was noted 20 times. The N.W. winds were the strongest, and the N. the most frequent. The weather was clearest at noon, most hazy at midnight. The pressure shows a maximum about 6 p.m., a minimum about 6 a.m.



The maximum temperature occurs about 2 p.m., the minimum 2 a.m. The wind-rose, compiled from all the wind observations, in number 168, the directions reduced to 16 points with their mean force, is given below. Snow-drift was noted 70 times.

On the 1st, daylight was noted at 8 a.m., dusk at 4.10 p.m.; on the 28th, it was daylight at 6 a.m., dusk at 6.15 p.m.

Remarks, 1858, February.

1st. A sooty fox shot.

2nd. Several bear tracks in the neighbourhood.

Noon. Lat. 72° 28′ 28″ N., long. 61° 9′ 45″ W., no bottom 170 fathoms, at 110 fathoms 29°·5, sp. g. 1·0278.

9 p.m. Faint aurora in S.E. horizon, visible for 10 minutes.

10 p.m. Faint aurora from S.E. to E.N.E., an arch, 28° above horizon, extremity touching horizon, S.E. extreme brightest, with occasional streams towards zenith; ceased at midnight.

3rd, 8 p.m. A broad crack running N.E. and S.W. half mile to north of ship.

11 p.m. A band of aurora from S.E. horizon to zenith, visible for 15 minutes. Ice in motion.

4th, Noon. Lat. 72° 24′ 48″ N., long. 61° 10′ W., ice opened in several places. Thermometer inserted perpendicularly 4 feet in a large snow bank, touching the hummocks of ice below, enclosed 24 hours, + 25°. Ice in motion. Several seals and dovekies seen.

5th, 8 a.m. Thermometer in snow bank horizontally 4 feet from air, 3 feet from ice below, 3 feet from top of bank, enclosed 24 hours, −4°; temperature in snow hut −13°; external air −25°·5. Six dovekies shot.

8 p.m. The floe appears to have a lateral movement respecting S.W. and N.E. The northern ice going to south-westward, the southern floes to N.E., or *vice versâ*, and the point of contact near the ship. Lanes are opening in the same direction, and the edges seem moving in the same. An old floe has cracked in several places, the nearest fissure being 15 fathoms astern.

6th, 8 a.m. Inserted thermometer for 24 hours in snow bank, 4 feet from ice, 2½ feet from upper surface of bank, and 4 feet from outside of bank, horizontally, −10°·5; external air, mean, −21°·5.

9 p.m. A heavy nip 400 yards north of ship, no water visible.

Mean of eight observations, in thickness of old floe 4 feet 5¼ in.; of superposed snow 9½ in.; new floe, formed when we were being froze in, 3 feet 7 inches; superposed snow 8½ inches. At midnight, slight aurora, N E.

7th, 8 a.m. Thermometer in snow bank 24 hours, horizontally 4 feet, 3 feet from ice, and 3 feet from top of bank, −2°·5, mean of external air −24°·5.

9.45 p.m. Pale streaks and patches of aurora from S.S.E. to N., apparent for 45 minutes.

8th, Noon. Lat. 70° 22′ 22″ N., long. 61° 26′ W.

9th, 11 a.m. Faint parhelia.

9th, 10 p.m. Aurora from N.E to S.E.

10th, 2 a.m. Slight aurora from N. to S. passing through the zenith.

11th, Noon. A broad lane of water running E.N.E. and W.S.W., nearest part one mile astern of ship.

12th. Two seals seen

13th, 4 a.m. Slight patch of aurora W.

13th, Noon. Lat. 71° 59′ 16″ N., long. 60° 26′ 15″ W., a well-marked prismatic halo round the sun.

Several seals seen.

Midnight. Aurora S.S.E. to E., about 4° above horizon, with streamers half-way to zenith.

14th. Two dovekies seen.

14th, 12 a.m. to 1.30 p.m. Part of an ill-defined halo round the Sun, diameter about 45°, the extremities near horizon prismatic.

8 p.m. Ice opening in the lane two miles N.W. of ship.

15th, from 10 a.m. till 3 p.m. Imperfect halos round the Sun; diameters 45° to 90°.

Noon. Lat. 71° 38′ 30″ N., long. 60 31′ 30″ W.

6.30 to 8.45 p.m. Pale auroral arch, 4° above horizon from S.S.E. to E.N.E., with streamers towards zenith.

16th, 10 a.m. Slight prismatic imperfect halo round Sun.

7.30 p.m. Bright pale yellow aurora from S.E. to N., form of an arc, at times double and even treble, varying from 6° to 8° above horizon, with streamers towards zenith; having gradually shifted from S. to E.N.E., it ended at 1.50 a.m.

17th. Thickness of ice 3 feet 9 inches, increase in a month 1½ inches. Thickness of snow 9½ inches, increase in a month 1 inch.

17th, 10 a.m. Imperfect prismatic halo round Sun, 45° diameter, another fainter and external, about 90° diameter.

Noon. Lat. 71° 15′ 40″ N., long. 60° 45′ W.

4 p.m. A lane of water E.N.E. and W.S.W. two miles N. of ship, in which several seals were seen.

8 p.m. Halo round Moon; diameter about 46°.
9.45 to 10 p.m. Patch and arch of aurora S.S.W. to S.S.E. about 4° above horizon.
18th, 4 a.m. An aurora from S.W. to E. during middle watch.
Noon. Halo round Sun, diameter about 45°.
8.30 p.m. Auroral arc about 15° above horizon, from S.S.E to E.
19th, Noon. Lat. 71° 1′ 57″ N., long. 60° 48′ 15″ W.
11.30 p.m. Auroral arc from S.S.E. to N.E., 9° above horizon.
20th, 8 a.m. New ice two miles N. of ship opened a wide lane of water E.N.E. and W.S.W. extending beyond visible horizon.
6 p.m. Prismatic cloudy halo round Moon, diameter 4° 20′.
21st, 8 a.m. Ice closing in the late crack N. of ship.
A fox track seen.
22nd, 8 a.m. A wide lane of water running E.N.E. and W.S.W. $2\frac{1}{2}$ miles N. of ship. Several seals and two dovekies seen, also a very recent bear track. No bottom at 180 fathoms, at 120 fathoms 32°·5, sp. g. 1·0272, at surface 29°, sp. g. 1·0278.
10 p.m. Halo round the Moon; diameter about 45°.
23rd, Noon. Lat. 70° 39′ 21″ N., long. 60° 34″ 45′ W.
24th, 10 p.m. The ship lifted slightly and the floe cracked in a line with the ship.
27th, 9 a.m. Snow observed to melt against ship's side; temperature in shade −22·5. Several lanes of water in sight. One seal shot.
Noon. Black bulb thermometer in sun −7°; thermometer in shade −17·5.
28th, Noon. Lat. 69° 50′ 24″ N., long. 59° 43′ 30″ W.
Midnight. Halo round Moon; diameter about 43°; Moon's altitude 19° 38′.

The Hydrographer submitted the following Memorandum on the Cape Squares (Minutes, p. 71).

M.O. 710.

In accordance with the wishes of the Council I have investigated the conditions under which the six squares off the Cape of Good Hope (442, 441, 440, 478, 477, 476) can best be treated graphically from the data books now in course of completion.

It is difficult at the commencement to assign a definite scale for the six complete squares, inasmuch as the number of observations in each 10° Square is unknown to me, and probably at the present time to those who are engaged on the data books. I consider, however, it may be assumed that the observations in the three 10° Squares south of the 40th parallel are few in number compared with the three squares north of that parallel, and it is, therefore, with these three southern squares that I should recommend a commencement to be made.

When these are fairly started a fresh departure can be taken for the remainder of the work, where, as I have observed, the observations are probably far more numerous, and the physical features more pronounced.

For a saving of labour it is obviously necessary to employ as few sheets as possible consistent with clearness. I have, therefore, as a tentative measure, prepared the three southern 10° Squares on one sheet, in anticipation that it will meet the number of observations in the special region; should this not be the case, then it can be taken as representing three 5° Squares.

I should then propose, one sheet for temperatures, air and sea, the latter to be in red (it is scarcely necessary to distinguish the years by colour), one sheet for barometer, one sheet for winds and currents, or these may be separated if found more convenient to do so.

Further as a tentative process for the commencement of discussion I should propose four typical months for the year, say January, April, July, October, and that when these four typical sheets for one element, say the air and sea temperatures, are completed, that the attention of the Council be drawn to them for further consideration and discussion, if necessary.

If on examination of the data books it should be found that the scale as given on the prepared sheet for the three southern 10° Squares is too small to render justice to the data collected, then the scale must be doubled, and the 10° Squares will represent 5° Squares: this will, of course, increase the number of sheets fourfold.

With 10° Squares we shall have 3 sheets of elements × 4 months = 12 sheets.
„ 5° „ 12 „ × 4 „ = 48 „

Passing to the northern 10° Squares. I should consider it probable, judging from what has already been done in the sub-square shaded on diagram, that the three 5° Squares immediately south of the Cape Colony (A, B, C) might require, at least for some of the elements, a larger scale than even the doubled one already referred to, that is to say, the single 10° Square of the present scale might represent a $2\frac{1}{2}$° Square. It is probable that the several 5° Squares (a, b, c, d, e, f, g) may be dealt with on the same scale as the three southern 10° Squares, but this question can be deferred till due progress is made in the direction already set forth.

There are a few questions to be decided in reference to charting the observations.

1. As regards temperature, whether air or sea, remembering that the whole region under review is remarkable for the mixing of cold and warm streams of water. Should they not be reduced to their mean daily values by the nearest approximate method, to be determined from the observations themselves in each succeeding 5° parallel of latitude.
2. Is it necessary to do more with the barometer readings than to reduce them to one common temperature 32° Fahr?

3. With regard to the grouping of observations in connexion with the memorandum by Mr. Charles Harding, except in very crowded localities, which perhaps in the six 10° Squares under review is confined only to one or two areas, the selection might be left to the judgment of the official engaged in transferring the observations to the sheets, as it would be scarcely worth the trouble of entering into elaborate calculations for graphical representation.

F. J. E.

Admiralty, March 28, 1878.

Read—A letter from Captain Toynbee stating that since last meeting three logs had been received, two of them being "excellent," as follows:—

Observer.	Ship.	Period.	Voyage.	Last mention on Minutes.
Capt. S. B. Gray -	Barque "Letterewe."	Jan. 28, 1877—March 4, 1878.	Liverpool to Sydney, thence to Manilla, and home.	—
„ W. Randall -	Ship "Iron Cross"	Sept. 4, 1876—March 9, 1878.	England to Calcutta, Mauritius, Calcutta, and home, viâ the Cape.	—

The Secretary was instructed to present the Atlantic Equatorial Charts to the above gentlemen.

The Secretary asked for authority to have the records for the self-recording observatories bound, and it was resolved that they be bound in cloth.

The Secretary reported that the arrangements for the publication of the Weekly Weather Report were not yet completed (Minutes, March 15).

A memorandum by Mr. J. S. Harding (Letter 709) on the subject of the accounts was presented, and it was resolved that the accounts be kept by double entry, and that the account for the Treasury be made up in accordance with their requirements.

The Council then proceeded to discuss the following suggestions for researches, &c. to be undertaken by the Meteorological Office in the year 1878–79.

In the first instance it was resolved that orders for instruments intended for any special research should be registered in the Office.

The following are the suggestions, with the action taken on each:—

1. Application of photography to determine the height of clouds and the direction and rate of their movements. (Suggestion No. 1, p. 13.)

The sum of 30*l.* was placed at the disposal of Professor Stokes and Mr. Galton for the above experiments.

2. The determination of the velocity of the upper currents of the atmosphere by means of automatic signalling anemometers, erected at high and difficultly accessible stations; the signals to be received at the nearest telegraph station, and transmitted to the central office by a simple signal, such as a letter of the alphabet. The signal would convey the information as to locality; for example, A might mean a velocity of 30 miles an hour on the cross of St. Paul's. (Suggestion No. 3, p. 14.)

The Secretary was instructed to communicate with Mr. H. Alers Hankey with a view of placing a signalling anemometer connected with the Office (Minutes 1873, pp. 39, 72) upon the top of Queen Anne's Mansions.

3. The desirability of the erection of self-recording instruments of a similar character at neighbouring stations, in order to compare the results. (Suggestion No. 6, p. 14.)

Postponed in consequence of Mr. Galton's absence from the Council owing to illness.

4. Discussion of the observations made at the seven self-recording observatories for the determination of diurnal range corrections (Minutes, 1869, p. 61).

The Secretary was directed to prepare a report on the subject.

5. Discussion of the Kew electrograms.

Resolved—That Professor Everett be communicated with on this subject as soon as his report (Minutes, p. 72) is in print.

6. Preparation of a Meteorological Atlas of the British Isles.

Resolved—That Mr. Buchan be informed that it is in contemplation at the Meteorological Office to bring out Physical Charts (Barometrical Pressure and Air and Sea Temperature) of the British Islands, on a somewhat larger scale than that adopted by him in the Journal of the Scottish Meteorological Society, and that he be asked whether or not he would be willing to assist in this work.

7. Researches on Anemometry.

It was agreed that this subject should be postponed until after the publication of Dr. Robinson's paper, now in the hands of the Royal Society.

8. Discussion (by means of synoptic charts or otherwise) of the condition of the atmosphere (particularly with reference to wind and pressure) on successive days over some large part of the Earth's surface.

Withdrawn for the present.

9. Method for investigating rapid variations of the temperature of the air depending upon the immediate locality and their influence upon the readings of a thermometer.

It was suggested that this might be done either by a metallic thermometer or by a thermo-electric arrangement, and it was agreed that the matter should be brought before the Council on a future occasion.

10. Employment of Theorell's or other mechanical meteorographs at first-class observatories.

The Secretary was instructed to obtain information as to the price and the performance of these instruments.

11. Construction of an inexpensive and moderately accurate mechanical meteorograph for use in second-class observatories, and in those ships where a careful system of observations cannot be undertaken.

Postponed for the same reason as No. 3.

12. Experiments on Evaporation.

Postponed for further inquiry.

13. Experiments on Solar Radiation.

The Secretary was instructed to write to the Kew Committee to ascertain if they are prepared to undertake an inquiry into the best means of obtaining a record of Solar Radiation, applicable under various conditions of climate, &c.

The Secretary stated with reference to the squall which caused the loss of H.M.S. "Eurydice" on the 24th instant, and the correspondence which had appeared subsequently in the "Times," that the barogram at Kew showed very slight oscillations on the day in question, and he was instructed to forward a tracing of the curve to the Secretary of the Admiralty.

Reported that the following cheques for March were drawn on the 25th instant:—

	£	s.	d.
Administration:			
R. H. Scott, salary	66	13	4
Special Researches, &c.:			
J. H. Dallmeyer, instruments	10	7	0
C. Harding, experiments on "weighting" observations	8	8	0
G. M. Whipple, electrometer, wind integrator, and cloud experiments	5	0	4
Office Expenses:			
J. S. Harding, jun. } Salaries and wages	27	15	6
T. D. Bell } Salaries and wages	11	2	2
J. S. Harding, sen. } Salaries and wages	*11	4	7
C. W. Jacques, rent for quarter	133	13	0
Pall Mall Coal Co., coals	5	15	0
Atkinson & Co., furniture	3	17	0
G. Scott Freeman, fire insurance 1 6 0			
" " 1 2 0			
	2	8	0
Pickford & Co., carriages	2	1	3
Williams and Norgate, books	6	6	3
For Land Meteorology; Quarterly Allowances, &c.:			
D. Thomson, Aberdeen	62	10	0
T. R. Robinson, Armagh 40 14 0			
" Expenses 9 9 3			
	50	3	3
W. L. Fox, Falmouth	65	12	6
R. Grant, Glasgow	61	17	6
H. Williams, Holyhead	2	13	5
G. M. Whipple, Kew 100 0 0			
" postages 0 16 6			
	100	16	6
C. Clouston, Orkney	2	16	9
G. H. Aird, Seaham	2	13	9
S. J. Perry, Stonyhurst	49	13	7
Carried forward	£693	8	8

* Five weeks to the 30th March.

	£	s.	d.	£	s.	d.
Brought forward -	-		-	693	8	8
J. E. Cullum, Valencia - - - -	14	3	4			
,, Expenses - - - - -	41	19	3			
				56	2	7
G. T. Watson, Yarmouth - - -	-		-	4	0	0
R. & J. Beck, zinc plates - - -	-		-	26	6	4
Hopkin & Williams, chemicals - - -	-		-	5	9	11
R. H. Curtis -				18	17	9
C. H. Thompson				10	13	4
J. A. Curtis - } Discussion, &c. of observations	-		-	14	8	10
T. E. Allen -				14	8	10
E. G. Aldridge -				*8	6	8
H. W. Chivers -				*6	10	0
For Weather Telegraphy; Quarterly Allowances, &c.:						
Postmaster General, telegrams, January -	-		-	180	10	1
Pewtress & Co., printing - - -	-		-	1	5	0
H. Todd, Cambridge - - - -	-		-	4	11	0
J. C. McGowan, Donaghadee - - -	-		-	0	13	0
J. Costello, Dover - - - -	-		-	3	5	6
J. Tilston, Holyhead - - - -	-		-	3	19	6
T. Lanceley, Hurst Castle - - -	-		-	3	19	11
A. P. Hay, Inverness - - - -	-		-	1	6	0
J. Fisher, Jersey - - - -	-		-	3	2	9
A. Howard, Killarney - - - -	-		-	0	13	0
G. Mitchell, Kingstown - - - -	-		-	3	6	4
P. Turnbull, Leith - - - -	-		-	0	13	0
F. Gaster, London - - - -	-		-	3	5	0
J. Lowry, Moville - - - -	-		-	3	18	4
W. D. Penny, Nairn - - - -	-		-	4	4	6
M. Mackintosh ,, - - - -	-		-	0	13	0
E. J. Lowe, Notts - - - -	-		-	3	18	0
J. W. Irvine, N. Shields - - -	-		-	0	10	0
J. Lucas, Oxford - - - -	-		-	3	11	6
J. Merrifield, Plymouth - - - -	-		-	3	5	0
W. Sandford, Portishead - - -	-		-	3	18	6
J. C. Walker, St. Ann's Head - - -	-		-	2	9	0
W. Thomas, Scilly - - - -	-		-	4	6	11
W. Brand, Shetland - - - -	-		-	3	5	3
J. Smith, Stornoway - - - -	-		-	4	7	6
W. Morison ,, - - - -	-		-	1	6	0
J. Trotter, Thurso - - - -	-		-	3	7	5
J. Macdonald ,, - - - -	-		-	0	13	0
J. Sinclair, Wick - - - -	-		-	3	6	3
H. Little ,, - - - -	-		-	0	13	0
G. T. Watson, Yarmouth - - -	-		-	4	11	8
C. Wakefield, York - - - -	-		-	3	6	0
A. Buchan, salary - - - -	37	10	0			
,, travelling - - - -	0	12	6			
				38	2	6
F. Gaster -				†29	19	9
W. L. Dallas - } Preparation, &c. of Weather Reports			-	†18	3	4
F. Brodie -				†16	2	5
For Ocean Meteorology:						
G. M. Whipple, verifications "A." - -	1	0	0			
,, ,, "B.T." - -	9	8	0			
				10	8	0
Carried forward -	-			£1,237	9	10

* Five weeks to the 30th March.

† Including allowance for Sunday telegraphy,

	£	s.	d.	£	s.	d.
Brought forward -	-		-	1,237	9	10
Negretti & Zambra, "A." instruments - -	93	15	0			
" " "B.T." " - -	20	10	6			
				114	5	6
J. H. Woodstock, packing cases - - - - -				3	8	0
J. Gill, Liverpool agent - - - - - -				16	3	5
J. R. Jones, Aberdeen agent - - - - -				11	18	1
Z. Scaping, Hull agent - - - - - -				5	19	9
Pewtress & Co., advertisements - - - - -				1	17	6
R. Rivière, labels - - - - - -				1	1	0
Street Brothers, advertisements - - - - -				1	2	6
H. Toynbee -	Reductions, &c. of observations and care of instruments.			33	6	8
R. Strachan -				27	15	6
C. Harding -				20	0	0
H. Harries -				*12	16	8
Miscellaneous:						
Negretti & Zambra, commissions - - - -				14	16	0
G. M. Whipple, " - - - -				25	14	0
J. S. Harding, jun., current expenses - - - -				75	0	0
" " - - - -				75	0	0
Total - -				£1,677	14	5

The following cheques were drawn for the remuneration of the Council (Minutes, p. 2):—

Prof. H. J. S. Smith, Chairman - - - -	£222	3	9	
Mr. De La Rue - - - - - -	110	18	8	
Mr. Galton - - - - - - -	136	5	0	
The Hydrographer - - - - - -	71	18	5	
Prof. Stokes - - - - - - -	132	13	0	
Lieut.-Gen. Strachey - - - - - -	66	13	6	
	£740	12	4	
Income Tax on 750*l.* - -	9	7	6	
	£749	19	10	

* Five weeks to the 30th March.

The Council then adjourned.

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